

ANC

POPULAR MECHANICS

MAGAZINE

REGD. TRADE MARK, GREAT BRITAIN, NO. 410426

WE

DEPT.



SEE PAGE 88

YOU WON'T GET ANYWHERE UNLESS YOU START



WHEN IT'S AN

Exide

...YOU START

Hunting parties have little respect for the man who's late. When time is so important, even a good excuse is rarely acceptable; a car-starting failure, never . . . for it can be avoided.

To arrive on time, be sure your car will start. When you buy a battery for your car, buy *starting assurance*. **REMEMBER**, a single starting failure can be far more costly than the little extra you pay for a trustworthy Exide Battery.

1888 . . . DEPENDABLE BATTERIES FOR 61 YEARS . . . 1949

"Exide" Reg. Trade-Mark U.S. Pat. Off.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto



'50 FORD

50 WAYS NEW!

NEW, NEW, NEW, THROUGH AND THROUGH!



New front seat spring construction gives non-sag support . . . new foam rubber cushion for lasting comfort.

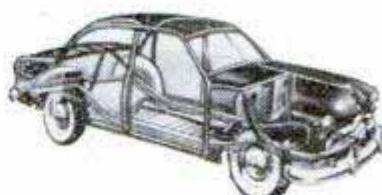


New luxury upholstery and interior trim tastefully selected to harmonize with new '50 Ford body colors.

New, effortless Push-Button Door Handles.



New Rotary Door Latches with spring-loaded nylon-plastic shock absorbers in striker plates.



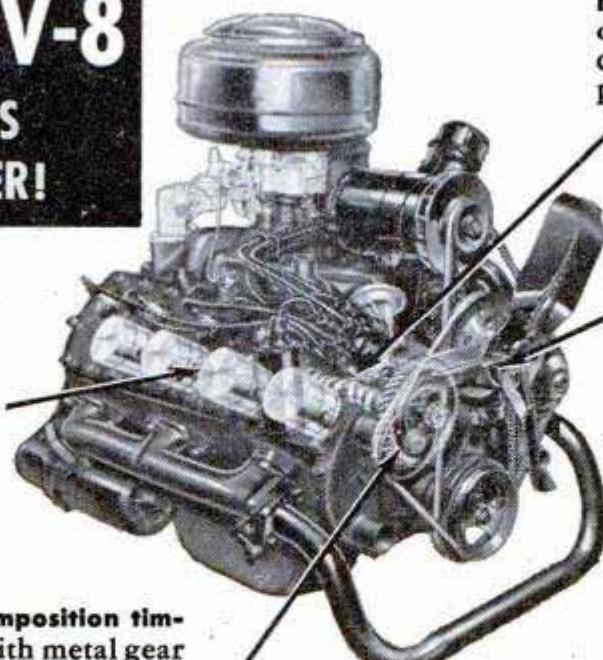
New bracing scientifically designed for greater strength and low weight. New sealing and insulation at 41 points give new weather-tight snugness and quiet comfort.

NEW ENGINEERING ADVANCEMENTS MAKE FORD'S 100 h.p. V-8 QUIET AS A WHISPER!



Dozens of other new body and styling features!

New super-fitted pistons of tin-plated aluminum alloy. Special steel struts in cam ground skirts control expansion, permit close clearances for extra quiet, longer life.



New cast camshaft features newly designed cam contours with special ramp for quiet, even flow of power at all speeds.

New three-blade fan is scientifically designed for increased air flow with minimum noise and power loss. New accessories drive, with two narrow V-belts over 3 pulleys provides quiet, efficient drive for fan, generator, and water pumps.

**Take a GOOD look...
Take a GOOD ride**

**AT YOUR
FORD DEALER'S**

New laminated composition timing gear meshes with metal gear on crankshaft for practically noiseless operation. Gears are wide-faced helical cut for smooth, positive drive.

There's a  in your future—
with a future built in!

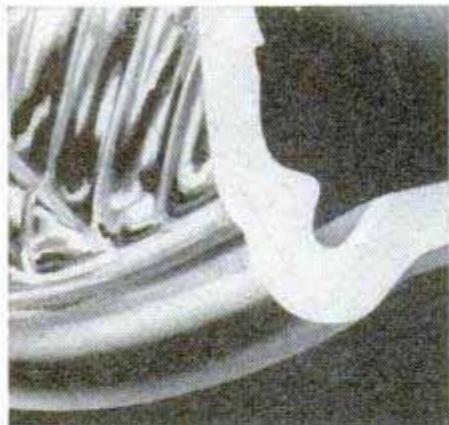
How easy can night driving be? Get General Electric headlamps and see!



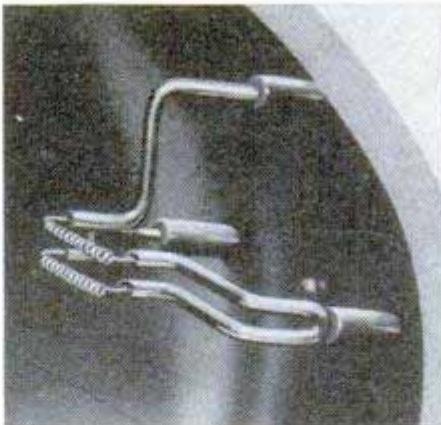
ALL-GLASS
sealed beam
HEADLAMPS

...they do not grow dim!

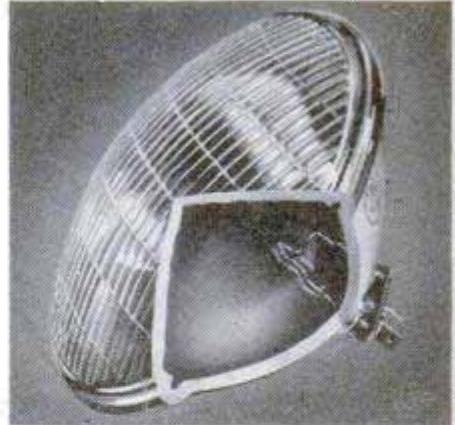
1. **NIGHT DRIVING** is easier with General Electric "all-glass" sealed beam headlamps because they average 99% of original light output at end of life. *They do not grow dim!*



2. **DIRT AND MOISTURE** can't get in to steal the light—due to the rugged, "all-glass", one-piece construction of G-E sealed beam headlamps.



3. **FILAMENTS** are held in vise-like grip. Won't shake loose on bumpy roads. Give 12% more light on the road for driving, 16% more light for passing.



4. **HARD-GLASS LENS** is precision-made to throw maximum light on road. Have lights checked when car is serviced—and insist on G-E for replacement!

You can put your confidence in—

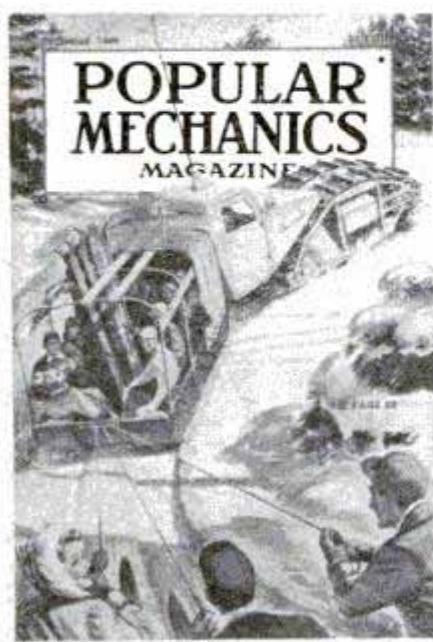
GENERAL  **ELECTRIC**

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

FIVE MILLION winter sports fans are striking out for the ponds, ski runs and toboggan slides across the nation. Artist Ed Lafferty shows a few cruising happily up a steep mountain slope on our cover. Skiing uphill is easy behind a powerful little "Sno-Motor." The vehicle is in use on the steep slopes of the West, but its value can't be measured alone in the leg labor it saves carefree skiers. The snow tractor frequently is called upon to carry rescue parties to injured skiers and victims of avalanches. It's an unfortunate fact that the best slopes for skiing also produce the most damaging avalanches. Out West a hardy group is digging into the secret of how avalanches spring to life. They can predict with a great deal of accuracy when and where a slide may start. For a story on their research turn to "Look Out . . . Avalanche!" on page 88

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BUILD ONE OF THESE YOURSELF . . . Save *Thousands* of Dollars!

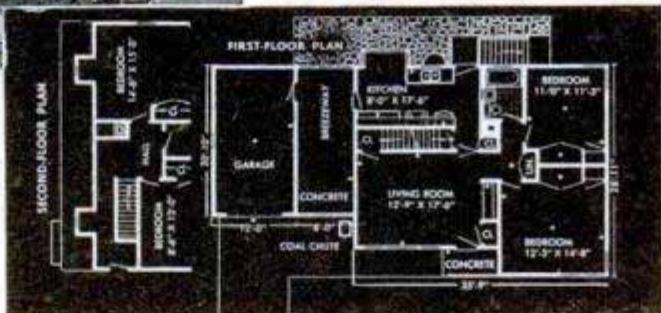
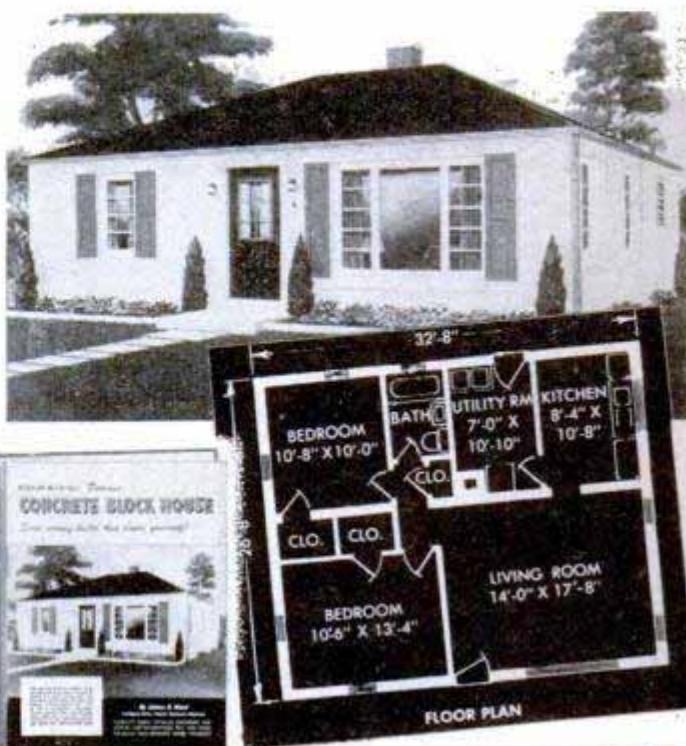
Build This 5-Room Concrete Block House for Only

Popular Mechanics Build-It-Yourself Concrete Block House is 26'-8" deep by 32'-8" wide. It has 675 square feet of comfortable living space—living room, two bedrooms, cabinet kitchen, utility room, bath and three closets. Insulated ceiling, hot air heating, gas or oil. Hot air ducts in ceiling, cold air ducts laid under floor. Its total cost was less than \$3650 including all material, heating, plumbing and electrical equipment and outside labor for installing the equipment and plastering all rooms.



Build This 5 Room
1½ Story Frame
House
for

\$7000



This beautiful, modern home, with breezeway and garage, as pictured, has been built in many locations at an average cost of \$7000 for all materials, equipment and some outside labor. It is 1½ stories with basement, recreation room, living room, kitchen, dining nook, two bedrooms, bath, plenty of closets and space

for 2 additional bedrooms on the second floor. It has an unusually large amount of good, usable living space that can easily be increased to meet the needs of a growing family. The house itself is 35'-9" x 28'-11"; the breezeway is 20'-10" x 8', and the garage is 20'-10" x 12'.

Beat the High Cost of Home Building! Get Book and Plans Now! No Previous Experience Needed!

If you can mix a batch of concrete and saw a board straight you can build either of these Popular Mechanics Build-It-Yourself houses, yourself. Yes Sir! In a few months of spare time you can laugh at the housing shortage and save several thousand dollars while acquiring a home you will be proud to own.

The big, basic idea behind the design of the Build-It-Yourself Houses is ease of construction (so a man could do the job himself with very little assistance) and get the most living at the least cost, considering attractiveness and suitability for any neighborhood. Either is a home anyone can enjoy and be proud to own.

A detailed Build-It-Yourself Book and a set of 10 full-size building blueprint plans are available for each house. Every part of the construction is simplified and thoroughly explained in the Build-It-Yourself Books from the turning

of the first shovel full of earth to the last flick of the paint brush. Every paragraph is written in plain, understandable terms and over half of each book is pictures and diagrams, some in two and four colors, that make every construction detail simple as ABC. The Concrete Block House book also tells how to make your own concrete blocks, how to select and buy a lot and how to build a house of bricks. The Frame House Book includes lumber and mill lists and design variations. Book and set of ten working blueprint plans are all you need to get started and enjoy the thrills of home owning, doing the job yourself and saving thousands of dollars.

If you want to hire a contractor or builder, instead of doing the job yourself, you can still enjoy a tremendous saving by working from the Build-It-Yourself Book and Plans.

ORDER FROM POPULAR MECHANICS PRESS

This mammoth bridge is made entirely of Erector girders. So strong it can support 200-lb. man.

Made of STEEL to Build like REAL

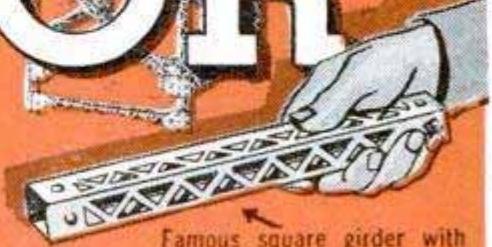
World's greatest construction toy
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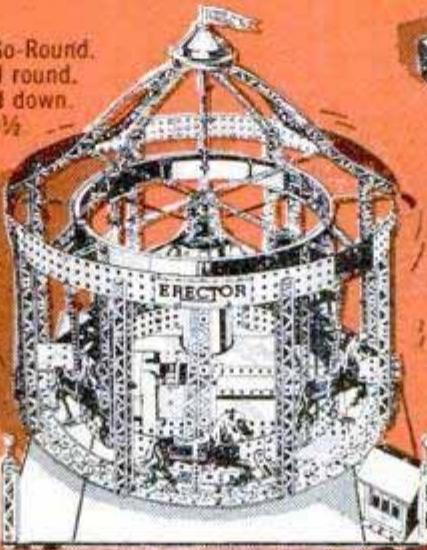
"Real engineering" nuts and bolts lock Erector parts firmly together.

Other Erector features—curved, straight and giant structural girders. Base plates in 7 sizes and shapes. Electro-magnet. Wheels, radiator, axles and other automotive parts. Total of over 135 different parts.

Dazzling Merry-Go-Round. Whirls round and round. Horses go up and down. Built with No. 10½ Erector and up.

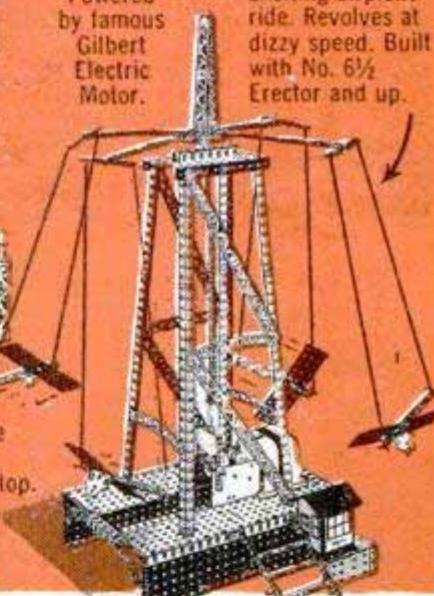


Famous square girder with interlocking edges—built only with Erector.



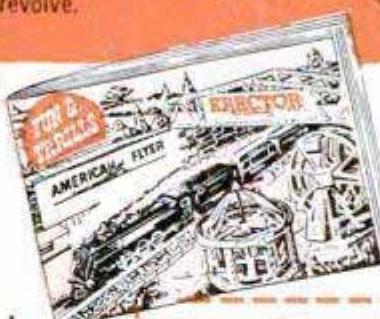
Powered by famous Gilbert Electric Motor.

Exciting airplane ride. Revolves at dizzy speed. Built with No. 6½ Erector and up.



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Gilbert Electric engine with automobile type gear shift for forward, reverse and stop.



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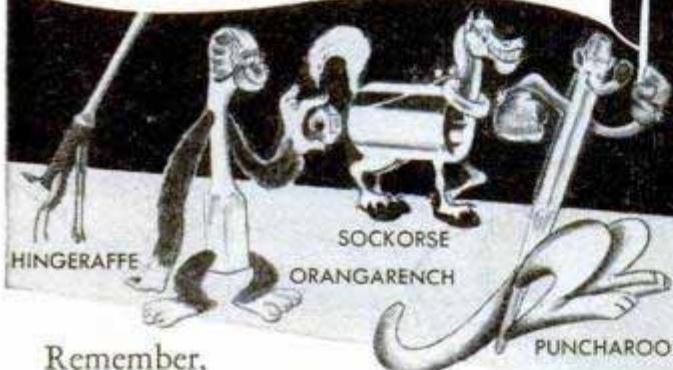
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PROTO is now the name for the leading brand of mechanics' hand tools. PROTO tools—formerly Plomb tools—are manufactured to the same high standards and are noted for superior design, special steels, scientific heat treating and long life. For the finest tools, buy the old-timers with the new name—PROTO tools.

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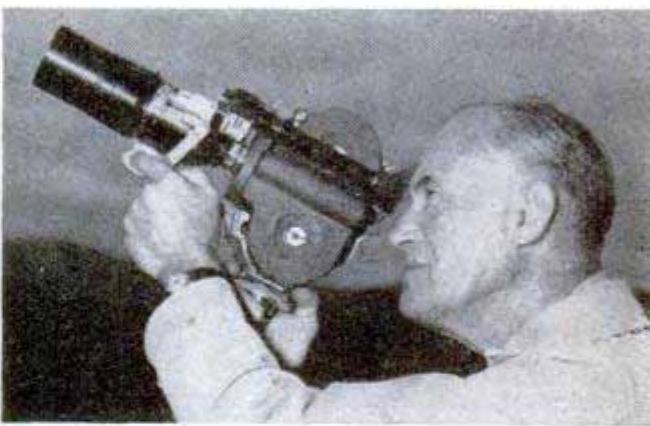
2255K Santa Fe Avenue, Los Angeles 54, Calif.

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in this corner.....

THE EDITORS



Calendar Artist

For a man who is happily adjusted to life we nominate Dick Bishop, the artist whose beautiful work is shown beginning on page 97. A writer and photographer set out to discover how he instills such realism and action in his paintings of wild fowl. They found him enjoying life atop a mountain in Vermont. One reason for his easygoing nature, no doubt, is that Bishop is completely adjusted to his work. Never happier than when on a hunting expedition, he tramps the swamps and woods in search of wild fowl. He shoots his beloved birds with an extraordinary slow-motion camera, shown above, that brings them fluttering up to arm's reach. When he grows tired of hunting, he returns to his mountain top and paints the birds, using his movies as a guide.

* * *

Letter to the Editor

Editor's Note: "Hot Rods and Electrons," a featured article in our September issue, was the story of young Tenny Lode, inventive genius now a student at the University of Minnesota. Associate Editor Hicks, who wrote the piece, afterward sent him a copy of our Spanish edition, Mecanica Popular, containing his story. Here is his reply:

"Dear Mr. Hicks:

"The Mecanica Popular was a very pleasant surprise and I appreciate it very much. My parents are wondering if, by any chance, your magazine is printed in one of the Scandinavian languages. [Yes, the Danish Populær Mekanik.]

"As a result of the story you wrote about me I have some fascinating research work to do. I have been asked to develop a portable lightning generator and a motor utilizing the heat of a fire or glowing coals for

(Continued to page 8)



IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$3,000 to \$10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

Over 2800 Certified
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You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C. P. A. Training and prepare for the C. P. A. examinations.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Statistical Control, Organization, Management and Finance.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

Write For This Free Book

For your own good, don't put off investigation of *all* the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. We'll also include "Ten Years' Promotion in One"—a book which has helped many men. Send us the coupon now.

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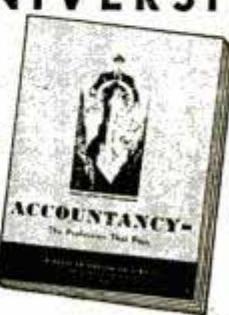
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Name _____

Address _____

City or Town _____ State _____



(Continued from page 6)

turning the barbecue spit. I have already been paid \$50 as part payment for the work I am doing on the lightning generator.

"One man from Pasadena intends to be in Saint Paul some of these days and will get in touch with me when he comes . . .

"Best wishes to you from my parents and myself.

"Tenny,
1323 Sherburne Ave.,
Saint Paul 4, Minn."

* * *

Letter to the Editor

Gentlemen:

My air-race article published in your August issue seems to have hit the nail on the head regarding the outcome of the Thompson Trophy Race. The planes flown behaved pretty much according to our speculation, with the powerful Corsairs taking the three top places.

Here is a photograph of Cook Cleland's



winning plane. Wing clipping is one of the oldest tricks in the air-racing game, but Cleland, winner of the Thompson Trophy for the second time, was able to go much farther in that direction than his competitors by the use of a clever new device. After cutting a full four feet off each wing tip, he installed large aluminum end plates on the stubs to preserve much of the lifting power which would ordinarily be lost through end spillage of the air flow. At the same time aileron effectiveness was also retained by the same device even though these surfaces were reduced in size.

Another, but unseen, advantage incorporated into the plane was Cleland's ace-in-the-hole. This was the use of concentrated hydrogen peroxide in the water-injection system. Files confiscated at the war's end revealed that the Germans had experimented with H₂O₂ in that manner, gaining an added boost of power as this unstable chemical broke down into oxygen and water. The Thompson champion is the first civilian to put this secret to work in a practical way.

John L. Mackenzie,
9900 Cudell Ave.,
Cleveland, Ohio.

Is High School High enough?

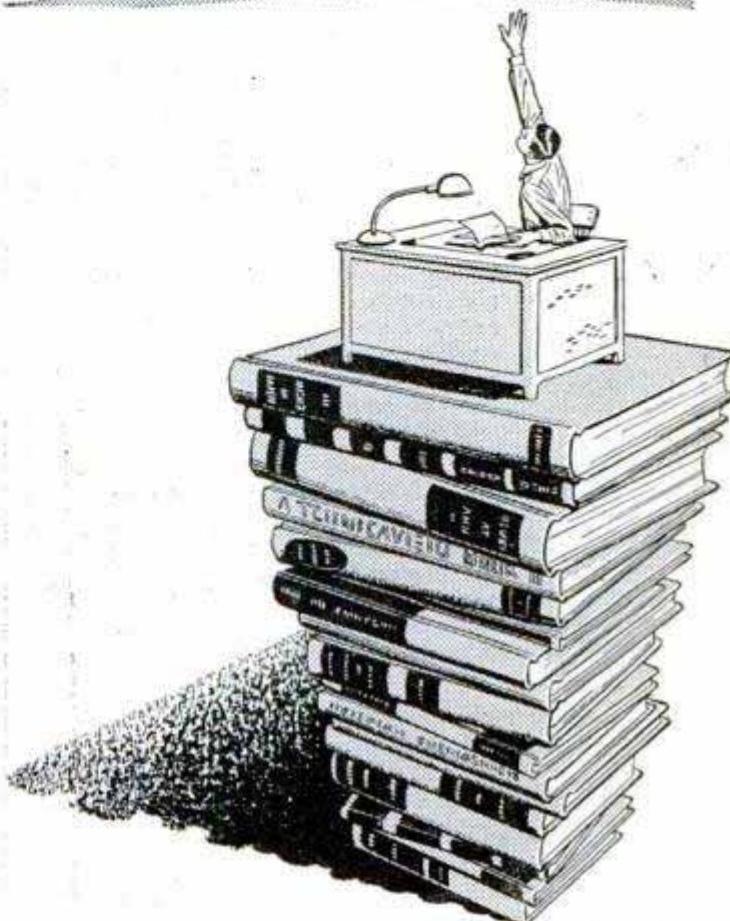
IF you were smart enough to finish high school, you already know the answer. A high school diploma is a *must* if you want a decent job at a decent wage. But it's *not* enough if you want more: Real security. Responsible positions. Big rewards.

I. C. S. training is *specialized* training that helps you go farther, *faster*. It supplements your high school education with the practical, working knowledge you need for immediate as well as future advancement. Equally important, it gives you the confidence and self-assurance so characteristic of competent, well-trained, *successful* men.

The courses of these famous schools are designed so you can *learn* while you *earn*. You study in your spare time. At work you prove and apply what you learn.

This system of training is backed up by 58 years of I. C. S. experience. It is successfully proved by thousands of students reporting promotions and pay increases. It can mean the difference between "halfway" and "headway" for you.

Job competition is getting stiffer every day for high school graduates. Mark and mail the coupon **NOW!**



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[Electrical Courses](#)

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 - Diesel-Electric Gas Engines
 - Diesel Engines

 - Mechanical Courses**
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 - Aircraft Drafting Flight Engineer
 - Forging Foundry Work
 - Heat Treatment of Metals
 - Industrial Engineering
 - Industrial Instrumentation
 - Industrial Metallurgy
 - Machine Shop
 - Machine Shop Inspection
 - Mechanical Drafting
 - Mechanical Engineering

Mold-Loft Work

- Patternmaking—Wood, Metal
 - Reading Shop Blueprints
 - Sheet-Metal Drafting
 - Sheet-Metal Worker Ship Drafting
 - Ship Fitting Tool Designing
 - Toolmaking Welding Engineering
 - Welding—Gas and Electric

 - Railroad Courses**
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 - Diesel Locomotive
 - Locomotive Engineer
 - Locomotive Fireman
 - Locomotive Machinist
 - Railroad Section Foreman
 - Steam and Diesel Loco. Eng.

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Length of Service _____ **In World War II** _____ **Enrollment under G.I. Bill approved for World War II Veterans. Special tuition rates to members of the Armed Forces.**

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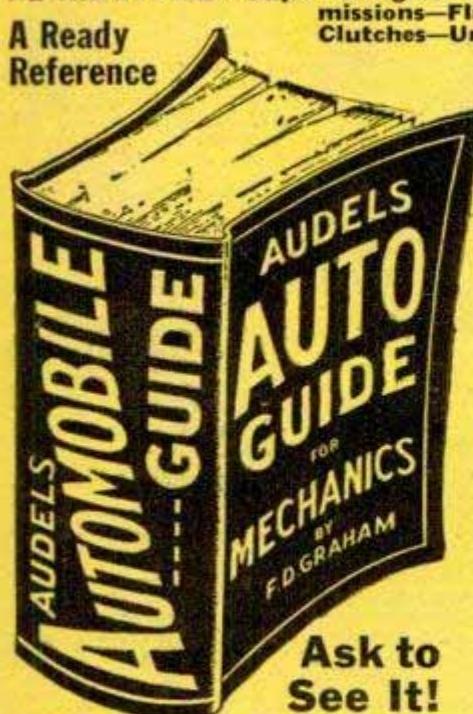
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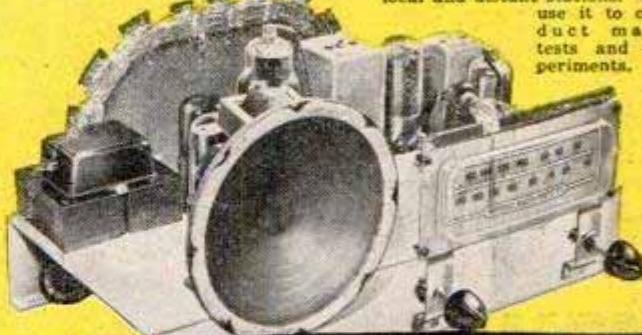


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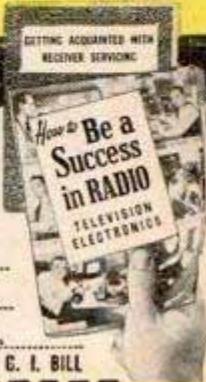
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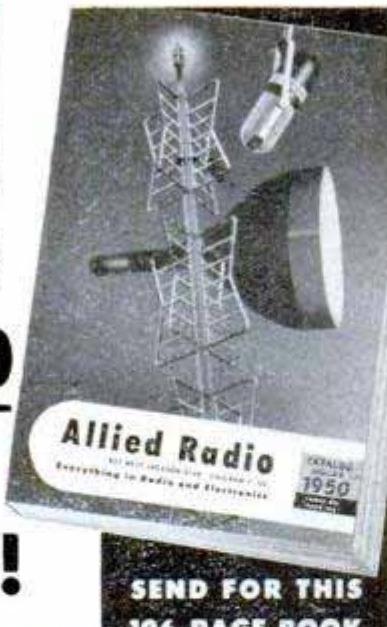
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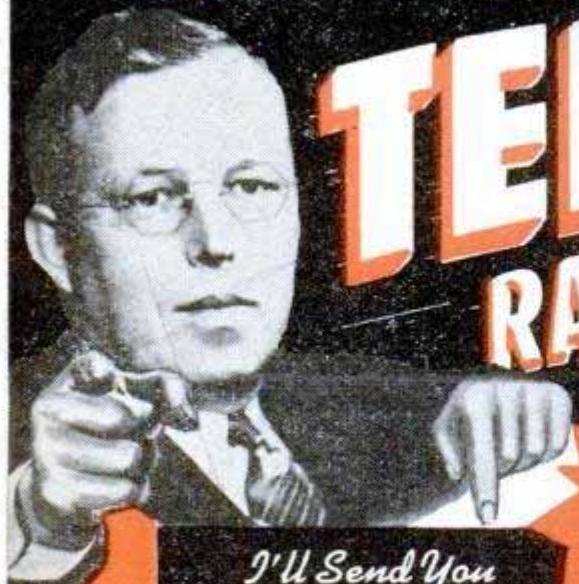
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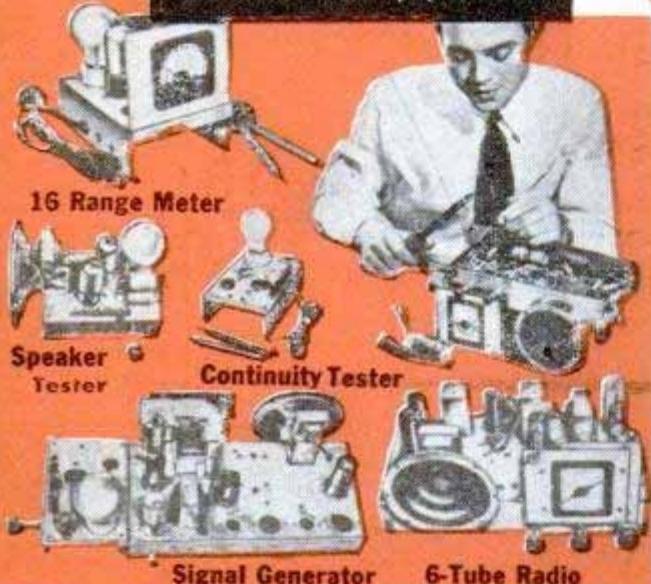
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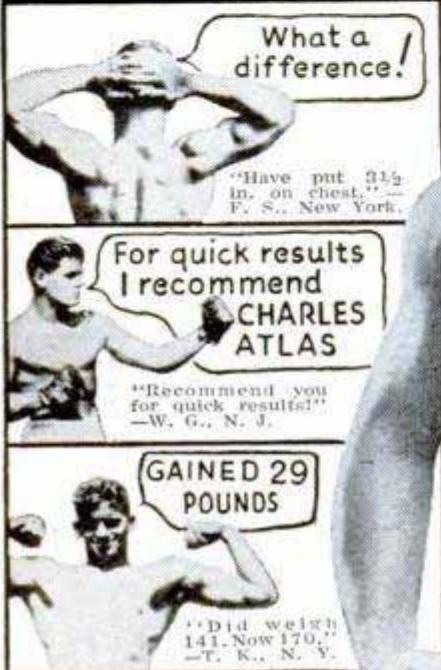
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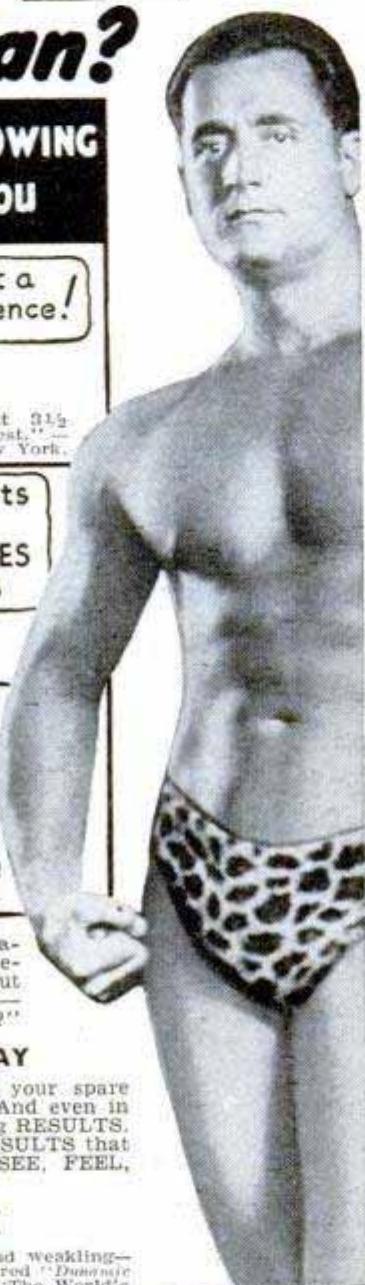
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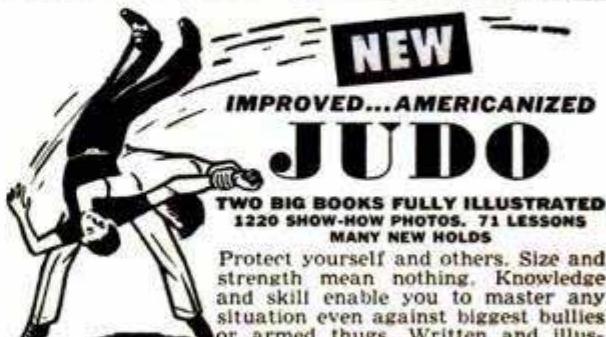
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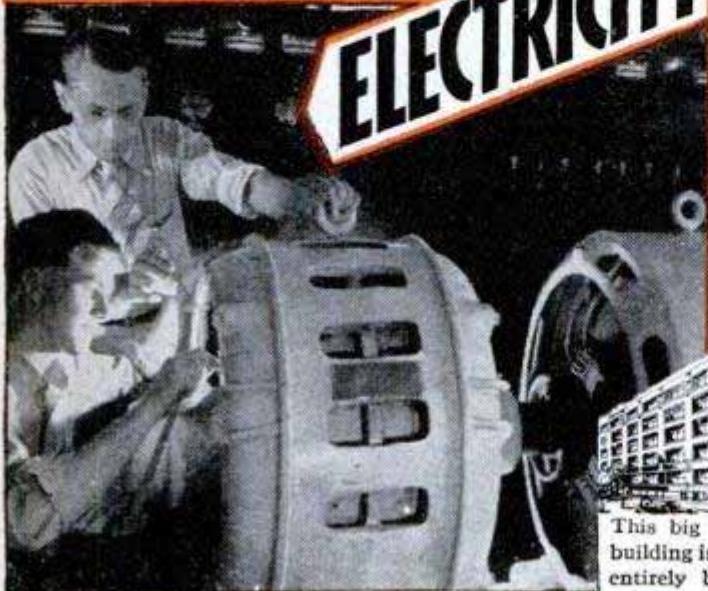
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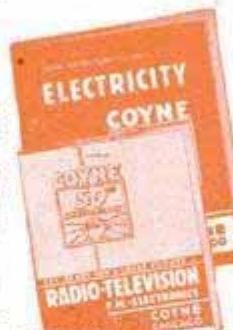
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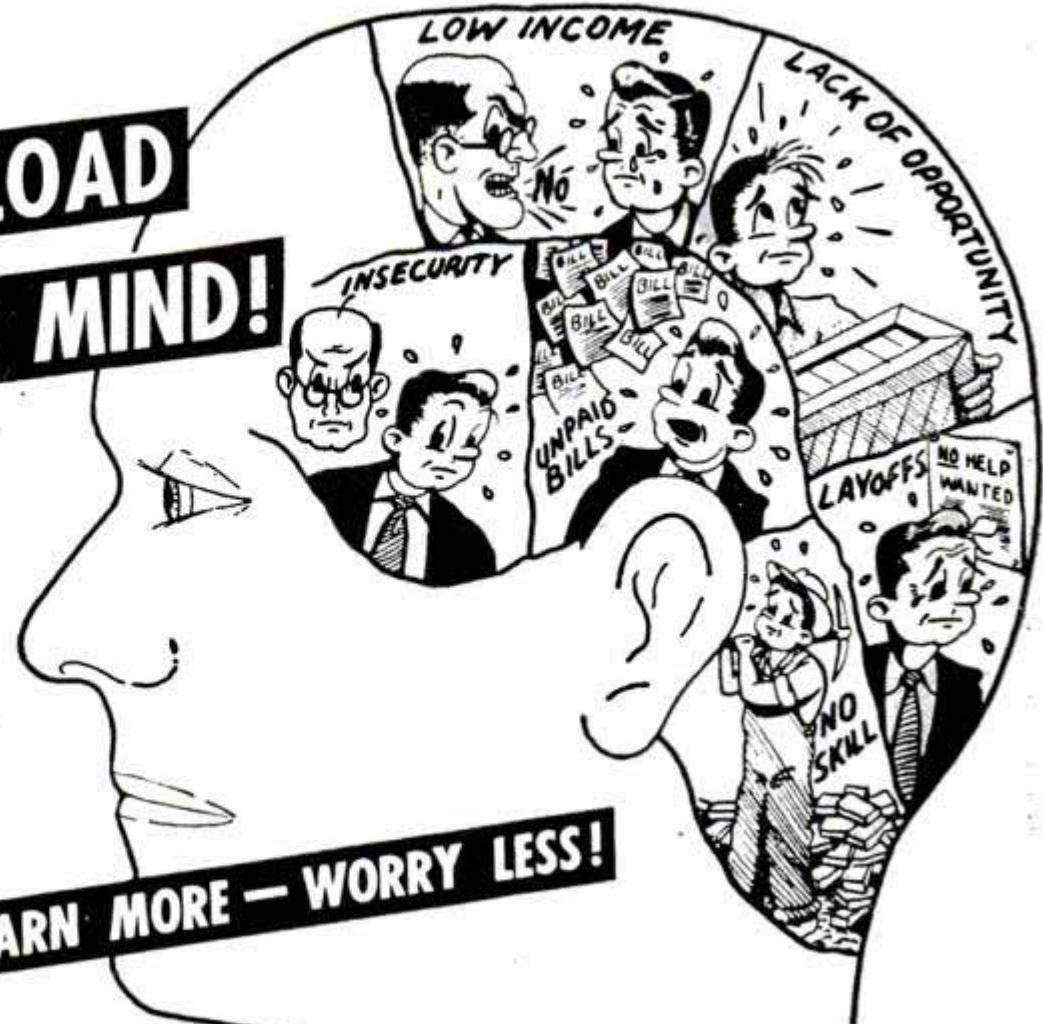
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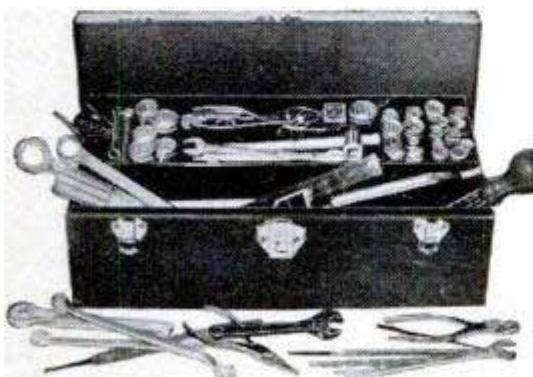
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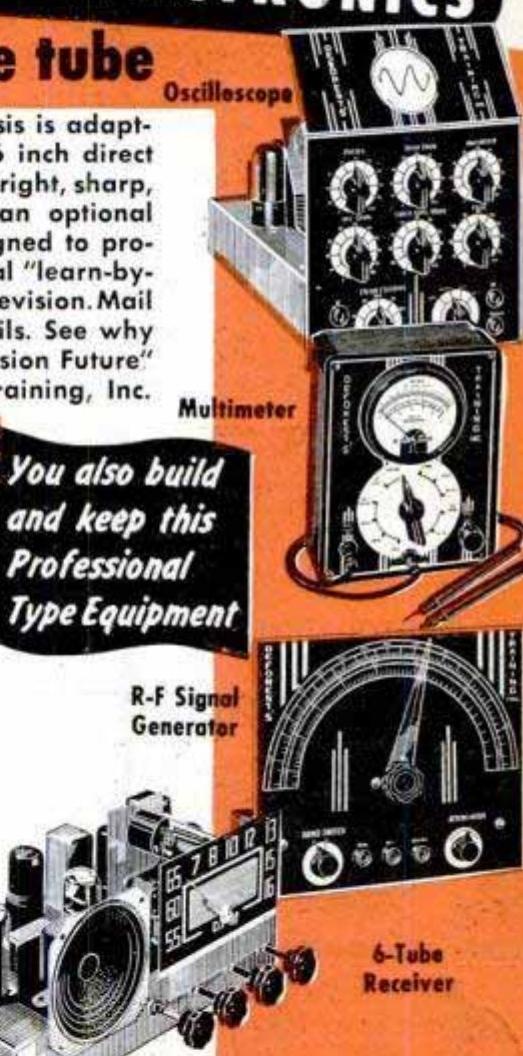
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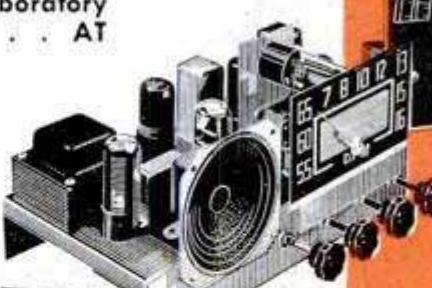
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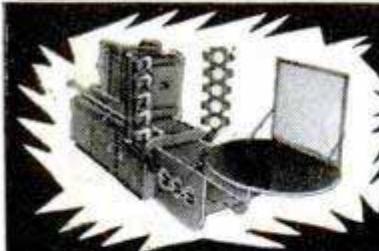
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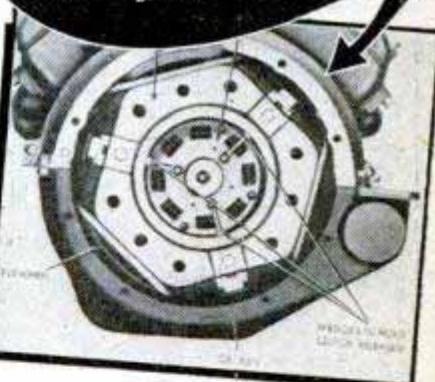
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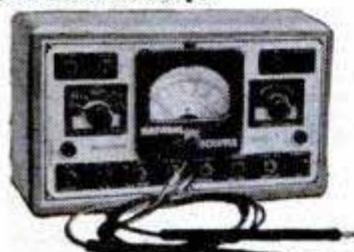
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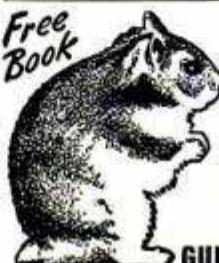


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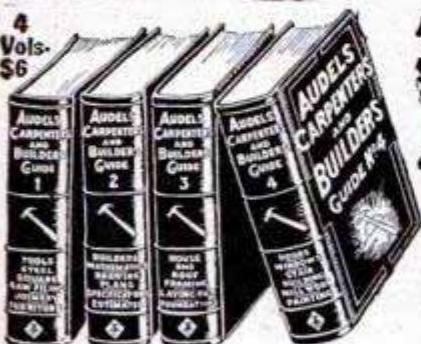
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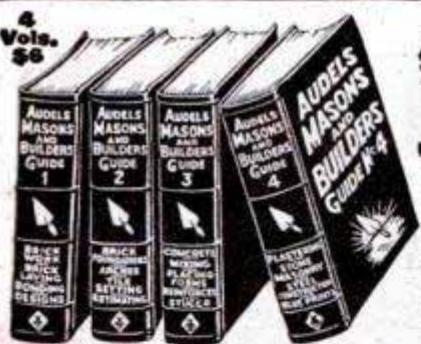
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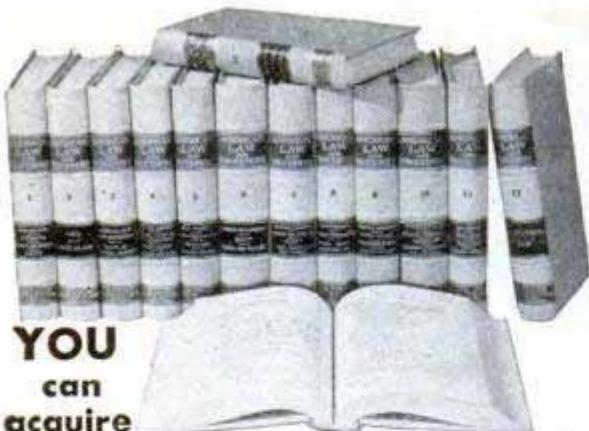
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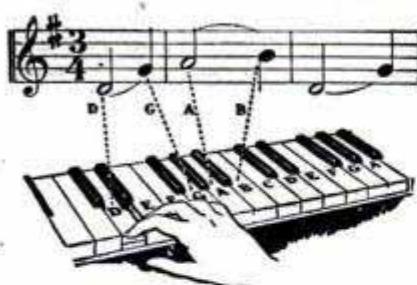
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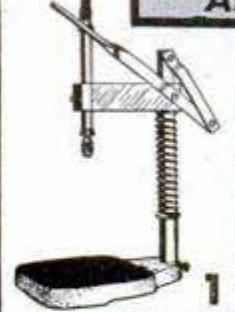
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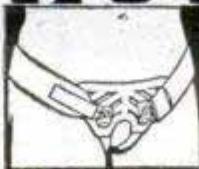


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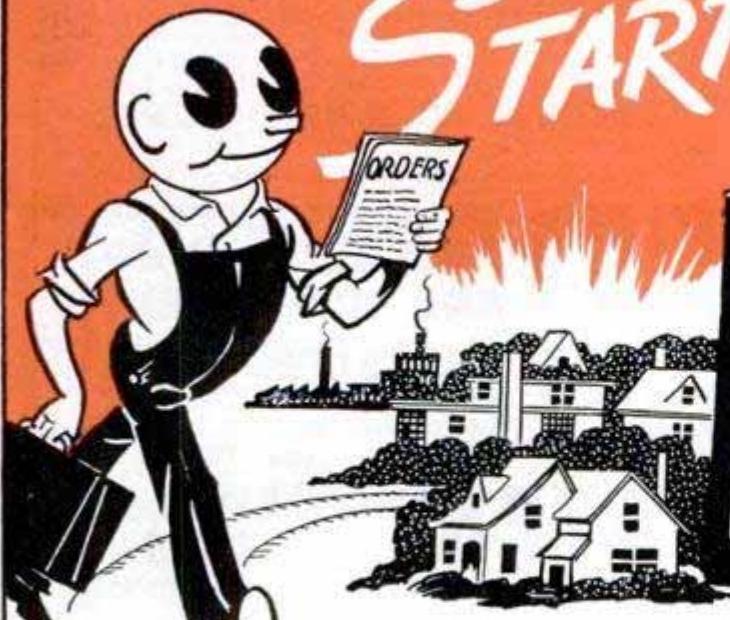
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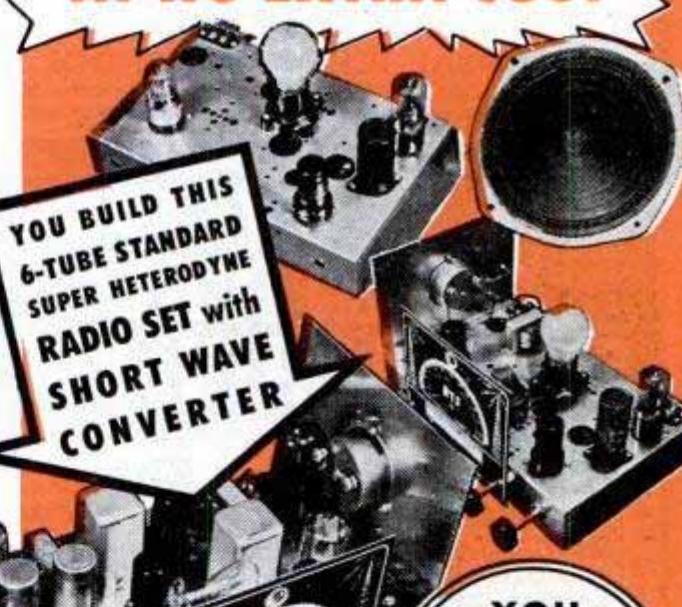
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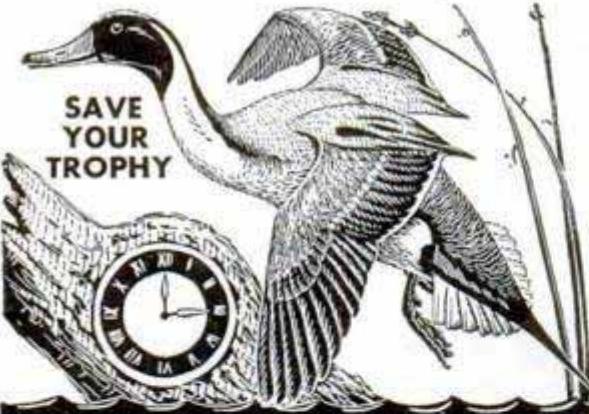
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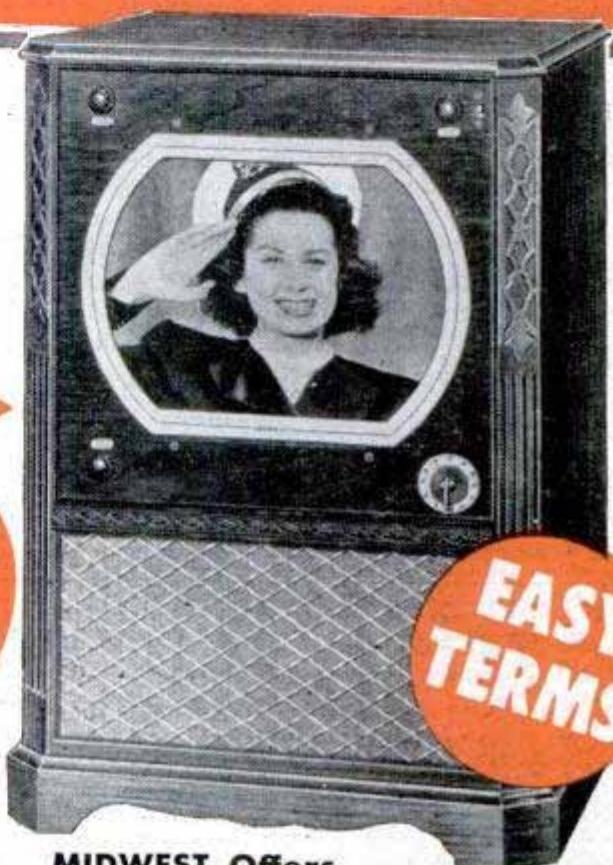
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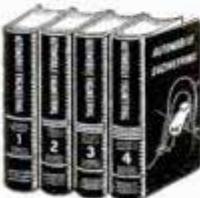
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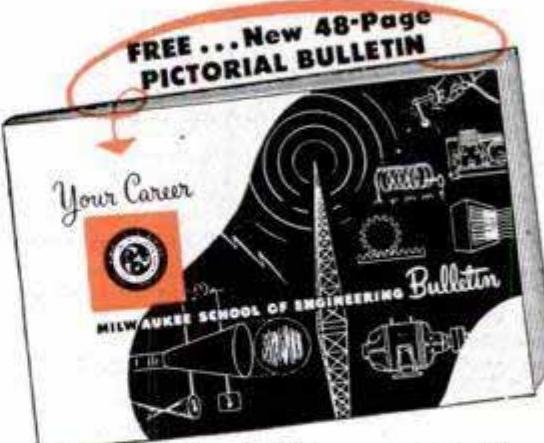
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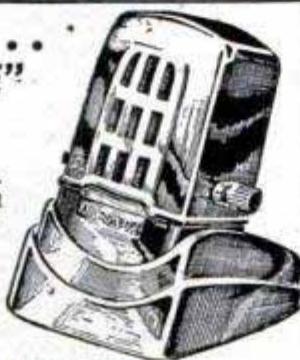
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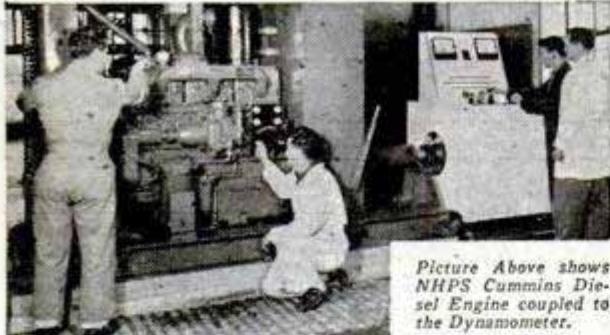


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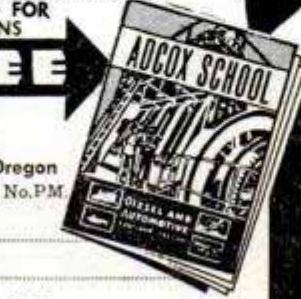
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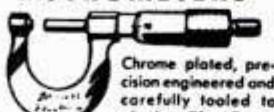
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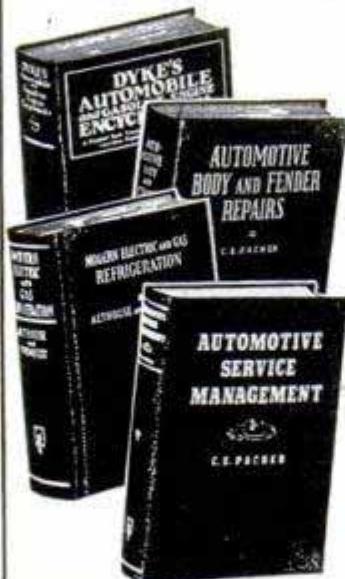
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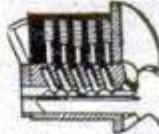
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START Profitable mail order business. Good profits; literature free. United Mail Service, Box 355, Roselle, Ill.

DECORATE Discarded furniture and tinware for home or profit. Free details. The Stewarts, X-3, Bridgewater, Mass.

BIG Money in mail order business! Learn how! Profitable! Easy! Free details! Hurry! Pearson, P.O. Box 652, New Kensington, Pennsylvania.

OPERATE Profitable screen process printing shop. Kits, books, complete supplies. Catalog 10c. Artisan House, 230 West 4th St., Cincinnati 2, Ohio.

BRILLIANT Opportunity! See "Amazing" in Home Craftsmen section. Komar, LaPorte.

EARN Extra money working with figures. Jimmy Sherrad, Pavo 1, Ga.

MAKE Perfume. Men, women write Carey Laboratories, 1914 Chouteau, PM, St. Louis 3, Mo.

"FROG Raising!" New book tells how! Illustrated literature free. Marlboro-A, Box 7002, New Orleans 19, Louisiana.

EXCELLENT Mail selling propositions! Write Wehner, Box 142-A2, Roxbury 19, Mass.

METALLIZE Baby shoes. Excellent profits. New system assures success. Free details. Treasures Forever, 38-B Michigan Ave., Lynn, Mass.

CO-PUBLISH Mail order and hobby magazines for profit, prestige, publicity. Man or woman conduct from home or office. City-suburban. Limited time or capital no handicap. Generous introductory offer. Write for free details. Watts Business Service, 3837-A Chestnut, Kansas City 3, Missouri.

FIX Typewriters, full or part time. Inexpensive copyrighted home study course quickly trains you for high earnings. Factory methods cover all phases with drawings and illustrations. No curiosity seekers. Typewriter Repair, 1215 Corbet, Tarentum, Pennsylvania.

UNPAINTED Figurines. Free list. Progress Company, 4033-P Chowen, Minneapolis 10, Minn.

UNIQUE Household cleaning product. Every housewife prospect. Sell direct, by mail; complete selling plan tells how. Inquiries answered promptly. Excelsior Service, 1330 January, St. Louis 10, Mo.

MAKE Your mail order venture pay. 20 years experience. Mathews Company, 4501 Oakmont, Philadelphia 36, Penna.

SAWDUST. Turn it into cash. Six methods. Instructions 25c. Charles, 12-APW, Norwood, Ohio.

MORE Money—Easier! Revolutionary methods make public bookkeeping easy, interesting, profitable. Earn to \$5.00 hourly within short time! Simple, complete instructions. Full, spare time. Success-revealing information free. Auditax Systems, 10775-A Tabor, Los Angeles 64.

FREE Particulars "profitable home business projects." Cottage Industries, 2804-E Hanover, Omaha 12, Nebr.

SELL Our business cards by mail. Profitable lifetime repeat orders. Small "starter" plan. Lynn, 5710 Bankfield, Culver City, California.

DON'T Miss our advertisement under Auto Supplies. Faulkner & Assoc.

PROFIT From your hobby! Plan your mail order business by using tested system. Price \$1.00. Green's, 115 Oxford, Toronto, Canada.

DOLLARS Three ways with "Kitty-Kat" ready-cut baby shoes. Complete local and mail order plans. Write No-Co-Ro, Oakland 6-K, California.

MOLDING Rubber for hobbyists, industry, classroom projects! Flexible molds easily made from the best quick-drying white liquid rubber! (Gallon, \$7.95; quart, \$2.95; sample half-pint \$1.00) prepaid parcel post! Plastercraft Supply Co., 3051 St. Clair Ave., Cleveland 14, Ohio.

FOR More business rent New York office under your name. Rates—Individuals \$12.00 yearly. Firms \$18.00 yearly. Established 1926. Co-operative Office Service, PM-126 Lexington Avenue, New York City 16.

GET Orders by mail for real merchandise. Plenty first; repeat business. Everything furnished! Write: Edgar Burdeau, 32-P, Walnut, Northampton, Mass.

HAVE Home mail business of your own—Run ads; mail literature. Very profitable! Write: Ted Gordon, 711-P East 40th, Chicago 15.

MAKE Money in profitable home operated mail business! Thousands do. Rush name for revealing literature. Smith, Box 2592-E, Hines, Illinois.

TIN Cans. Turn them into cash. Nine methods. Instructions 50c. Charles, 12-APX, Norwood, Ohio.

CONVERT Hand mowers to power mowers. Do it now, this winter. Sell the Handy-Dandy conversion kits. Easily installed on 16 to 20" mower. Use any small gasoline or electric motor. Quick delivery. Kits purchased with or without engines. Also new Garden Cultivator. Cultivates 3" deep. Attachments available: weed cutter, lawn mower, and snow plow. Retail \$124.50 with cultivator 1 hp. engine. Snow plow only \$11.95. Discount to dealers. LeClaire Manufacturing Company, LeClaire, P.M. 11, LeClaire, Iowa.

LEARN Electrical appliance repair. House wiring, motors, washers, cleaners, refrigerators, lamps, auto ignition, etc., complete illustrated course. Tools furnished. Free booklet. Pacific School, 7219 South Broadway, Los Angeles 3.

AUTOMATIC Saw setter used with Foley filer. Stadick Manufacturing Co., New Ulm, Minn.

SELL By mail. Good deal with nice profits. Home City Services, Box 1062-PM, Springfield, Mass.

REFRIGERATION And air conditioning. Complete, illustrated course. Free booklet. Mechanics School, 7219 South Broadway, Los Angeles 3.

"**WATERLESS** Hand cleaner." Make, sell. No machinery. Build profitable business. Formula \$1.00. "Wax-o-Glass" cleans glass; polishes metals. Formula \$1.00. "Wipe-on auto paint" formula \$1.00. Metalizing baby shoes, complete process \$1.00. All four formulas only \$3.00. Satisfaction guaranteed. Ideal Formula Service, Park Ridge 11, Illinois.

WOULD You pay 3%—first \$350 made? Book "505 Odd, Successful Enterprises" free! Work home. Expect something odd! Pacific, Oceanside, Calif.

BRONZED Baby shoes mountings; metals, onyx, plastics, hardening solution. Wholesale, Box 2095, Wichita, Kansas.

MAKE Perfumes at home. Very simple. Free details. Tropical, Box 5652, Chicago.

40% COMMISSION On fast-selling item. Every shopper a prospect. Send \$1.00 for sample. E. L. Edwards Company, 5333 Georgia Ave., Washington, D. C.

IMPORT-EXPORT Agency opportunities, unlimited profits, hundreds of overseas connections seeking representatives in U. S. List \$1. Stout, 1110P, Caesar, Pasadena 10, California.

OWN A printing business. Good profit printing cards, stationery, etc., in spare time. Easy rules furnished. Have home shop. Write for details. Kelsey Corp., Meriden 24, Conn.

MANUFACTURERS Getting rich with new post-war products, all lines. You can easily make them at big profit from guaranteed, chemist-developed formulas and analyses. Literature free! Miller, Analytical Chemist, Tampa 6, Florida.

BRONZING Baby shoes is big business. Start your own business for \$5.95 includes materials and instructions. No equipment required. Particulars free. Metaloids, Box 2095, Wichita, Kansas.

WHERE To buy 500,000 articles wholesale. Details free. Krueger, 3418A Wolcott, Chicago 13.

BABY Shoe metalizing. Modern, simplified practical system. Schoettle, Friendship, Ohio.

MONEY Making opportunities. Free literature. L.R.A. Products Co., Biggs, Calif.

EARN Money at home with your typewriter! Spare time. Details free! Edwards, Publisher, 3915-P, 12th, Des Moines 13, Iowa.

FREE! Illuminating folder "A Business Gold Mine." Real dividends for your spare time in lucrative business. No personal selling. Kabel, 1413 W. Tioga St., Philadelphia 40, Penna.

MIX, Sell chemicals producing brilliant-colored wood fire flames. Unlimited winter sales. Sample 25 cents. Formula \$2.00. Boone Consultants, 1181 Wilshire Court A, Cincinnati 30, Ohio.

CASH In your spare time. Make big money sharpening circular saw blades with powered gurnier. Free instructions. No experience necessary. Small investment. Start with as little as \$13.50. Big demand—you earn immediately. Free catalog. Belsaw, 315-H Westport Road, Kansas City, Missouri.

GET Dollars by mail. Your orders filled free. Satterfield, Box 345, Mansfield, Ark.

GROW—Sell potted flowers, vegetable plants. Details free. Shifter Associates, Box 129, Millersburg, Penna.

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PROFITABLE Home business. Start on small capital with latest tested formulas. Interesting booklet free. Pont, Box 635-XM, Terre Haute, Indiana.

UNUSUAL Opportunity for you in "Community Club Merchandising." Orga clubs—hold weekly drawings. Disc wide variety household utility products. Easy, fascinating employment. Profits—up to \$600 monthly. Kraft, Aurora 30, M.

BAKE Shoe mountings. Bookends, frames, etc. St. Albans Plating and Casting, 135-17 135 Ave., So. Ozone 20, N. Y.

BIG Money! Spare or full time in your home. No selling. Spray new miracle finishes, plush and suede, on signs, radios, automobiles, figurines, lamps, toys, etc. Our business is booming. Help us fill huge demand. Cash in now on big Christmas orders. New easy Flok-Kraft methods. Material costs few pennies. You get dollars. Free samples, complete powerful money making plan free. Write now! Coast, 1004A S. Los Angeles St., Los Angeles 15.

MEN - Women — "Everybody Likes Candy." Learn to make in a professional manner. (Our 39th year.) Ragsdale Candies, D5, East Orange, New Jersey.

SOAP From kitchen fats. Big profits. Mutual exchange. Details, sample bar, 25c. Cater, 638 West Colfax, Denver 4, Colorado.

ALUMINUM Name plates. Polished letters. Etched background. \$1.50. Agents wanted. Jack Kester, Deckerville, Mich.

10,000 FORMULAS And trade secrets. Free literature. Stillman Co., 555 Kings-ton Ave., Brooklyn 3, N. Y.

START Home plaster novelty business. Amazing course tells how. Literature free. Kemo-Courses, 4862 Catalpa, Chicago 30, Illinois.

SPESIAL Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

MAKE Money at home decorating greeting cards. We supply instructions. Powell, 5713-C Euclid, Cleveland 3, Ohio.

HOME Workers. Hand-spin Angora wool into yarn. Either sex. House of An-gora, PM, Springfield, Illinois.

MAKE Flexible molds! Cast plaques, novelties, bookends! Free sample! H. Tooker, Hamilton 4, Ohio.

HOW And where to obtain capital. Small and large loans. Free particulars. Star Service, Wapakoneta, Ohio.

DRSESDEN Craft figurine molds and many others, natural liquid rubber, statuary plasters, flock finishes, etc. Illus-trated catalog and "Plastercraft" manual free. Blue Rapids Supply, Blue Rapids, Kansas.

USE Your home as magazine subscription station. Represent all magazines. Liberal commissions. Supplies furnished. Big Christmas gift business now. Catalog, full details, free. McGregor Magazine Agency, Dept. 509B, Mount Morris, Ill.

WANTED Unused U. S. postage stamps, small discount. Advance Stamp Co., 24 East 23rd St., New York.

EXTRA Money. No selling; operate vendors. Amazing profits, details free. Silver King, Suite B, 622 Diversey, Chicago 14.

UNPAINTED Bookends, plaques, statues, figurines. List. Haverty Products, 1219 8th Ave., Altoona, Penna.

LIQUID Marble—Colorful, glossy! Molded, brushed, sprayed! Cast novelties, statuary, colored tiles. Flexible molds. Composition floors. Particulars free. Mar-blazing Service, Edwardsville, Illinois.

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BRONZED Baby shoe mountings, equipment and supplies. We manufacture world's largest assortment of all metal mountings. Wholesale only. Ramyr seleni-um platers \$39.95. Gold and silver plating assemblies low as \$97.50. Write for free copy of electroplating instructions. Tech. Dept., Hollywood Bronze Supply, 1770 N. Vermont Ave., Hollywood 27, California.

RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 8, Illinois.

UNPAINTED Figurines—Wholesale, retail. Illustrated list free! Oman, 642L Broadway, St. Paul 1, Minnesota.

CO-PUBLISH And advertise in The Central Mail Advertiser. Sample copy 10c. Low rates. Large circulation. Bagby Print-ing Co., Georgetown, Ohio.

HOW To set up and run a mirror shop! Resilver mirrors. Make chipped glass mepistles. Electroplating salts and recti-fiers. John Sprinkle, V60, Marion, Indiana.

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our idea, 280 manufacturers patented or unpatented. on Bureau, 208M Clinton.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for cast metal autos, soldiers, ashtrays, banks, etc. keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. "Cash-in" on holiday orders now being placed. Write for full information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

LEARN Piano tuning, repairing at home. Tremendous field! Piano parts, tools furnished. Established 1935. Empire School of Piano Tuning, 606-B East University Ave., Champaign, Illinois.

LEARN Sewing machine repairing at home. Install our wholesale motor kits. Make \$125 to \$300 in a week. Free particulars. Taylor Service Co., Hamilton PM, Ohio.

MAKE Money making new greaseless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

SPECIALTY Manufacturing. Big money business. Start on small capital with dependable formulas. Send for free interesting booklet. Howard Robinson, Ph. G., 1300-A South Ohio Street, Sedalia, Mo.

MAILING Postcards selling repeat mer-chandise is profitable. Everything sup-pplied. Details free. Gordon Publishers, Box 23, Pawtucket, R. I.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Min-napolis.

ENVELOPES Addressed accurately, rea-sonably. Fast service. We have capable addressers in your city. Glenway System, 5713-Y Euclid, Cleveland 3, Ohio.

VENDING Machines earn big money! An investment as low as \$10.50 will start you in this fascinating, profitable busi-ness that can lead you to the road of success and independence. Routes can be established and operated in either full or spare time with no experience needed. Write for full details and our free catalog illustrating our nut, candy, gum and stamp vendors; also pin ball machines, music boxes, etc. Write immediately to Parkway Machine Corporation, Dept. 7, 623 W. North Avenue, Baltimore 17, Mary-land.

YOUR Own profitable home business. Preserve live flowers to last forever. New simple discovery. Enormous demand all year 'round. Tremendous profits! Light fascinating work. Send \$2.00 for working equipment, instructions, and valuable sales plans. Satisfaction guaranteed or money promptly refunded. Alfred Her-mansen, 210 Fifth Ave., Suite 1102A, New York 10, N. Y.

IMAKE Big money in the mail-order business. You can do the same at home with copyrighted system. Write me. I'll tell you how. F. Little, R.D. #1, Glen-shaw, Penna.

POPCORN Equipment, potato chip out-fits. Long Eakins Company, 4960 Hi Street, Springfield 99, Ohio.

READ "Advance"—The voice of mail order. Offers money-making opportuni-ties, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

ABUSINESS In your own home! Our chemicals, plus free water and cheap "grocery store" materials can bring you over \$500 monthly earnings. Plans and formulas free. Chemica Division, 1269 S. Norton, Los Angeles 6.

FACTORY In your home garage! Mig. and sales rights, mechanics' water-less hand cleaner. \$500-\$800 monthly. No special equipment necessary. Formula free. Western Aircraft Mfg., Dept. D, Los Angeles 6, Calif.

START Mailorder bookshop — Every-thing furnished. 25c brings booklet, samples, exciting ideas. General Publica-tions, Ossining, N. Y.

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COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

137 WAYS To make money, in home or office, business of your own. Full partic-u-lars free. Elite Co., 220 Grand St., New York 13.

\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

BRUSH Plating outfits connect to a bat-tery. No tanks necessary. Good paying business at home plating autoparts, bath-room fixtures, bicycles, reflectors, silver-ing mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

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EXCELLENT Wages, at home finishing an absolute necessity to every auto owner. Details 25c. Box 292, Geneva, Ohio.

"MONEY In baby's smile." Practical plan for successful baby photography busi-ness, tested and proven in actual use. Free details. Don Gordon, 131-01-225th St., Springfield Gardens 13, N. Y.

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SEND Stamp. Quick money. Crane-Wiggin, Box 7625-D, Kansas City 3, Mo.

MAKE Money sharpening and gumming cross cut saws. One man and two man types. Also bucksaws and circulairs. Build power sharpening machine yourself at small cost. Plans, illustrations, instruc-tions \$1.00. Satisfaction guaranteed. Charles Lashley, Wellington 4, Ohio.

"DEPRESSION Insurance!" Own moneymaking business. Information free. "Pru-A-Ex," Kingsport, Tennessee.

EARN Big money—Be a sewing machine mechanic. Install motor kits. Others mak-ing \$130-\$300 week. Write for free sales manual. Continental Sales, Dept. PMC, 83 Graham Avenue, Brooklyn, N. Y.

MAKE Money addressing envelopes at home. Send for details. Post-All, 930-F Street, Washington, D. C.

QUIZ Contestants, question, name who. Picture \$100,000.00 bill. Names furnished, all currency 25c. N. S. Cole, Greenwood, Miss.

DOLLARS By mail! Magazine tells how! Sample 10c. Pinkerton, 1738 N.W. 12th, Oklahoma City.

MAIL Order information, articles, suc-cess stories. Read "The W-H Mail Dealer." Sample 15c. Folder "Advertising Results" included. W-H Publications, Box 1285-A, Nashville, Tenn.

MAKE Money with imprints. Instruction book and big mail 25c. J. M. Stenger, 500 20th St., Rock Island, Ill.

EARN Money at home. Little or no capi-tal needed. Free particulars. G. Huth-nance, 201 Holbrook, Flint, Mich.

PROFITABLE Mail order business! Oper-ate on "shoestring" from your home. Plans, ideas, moneymaking information 25c. Berg & Garcea, Box 266, San Bruno, Calif.

START Profitable mailorder business at home! "Mail Order World" is packed with ideas, plans, tips. Sample 25c. Romax, 3028 Tracy, Kansas City 3, Missouri.

CONVERT Burnt out light bulbs into fire extinguishers. Every home a pros-pect at your own price. Full instructions \$1.00. Details free. Fred A. Lewis, Box 104-B Kensington Station, Brooklyn, New York.

MAKE Extra dollars at home. Thousands do. Get dollars in the mail. Free facts. Al-fred Haseman, Beecher, Ill.

ANALYZE Handwriting for profit! Complete outfit \$1.00. Graphologists, POB-971, Philadelphia.

DELIGHTFUL Plans! Australia. South America. Free book "372 Unusual World-wide Businesses." \$800 month reported! Work home (U.S.A.)! Get surprise! Publishe-8X, Carlsbad, Calif.

MAKE Money at home in spare time. Raise Golden Hamsters. Small investment. Literature free. Golden Gate Hamstery, 631-G Richmond Street, El Cerrito, Calif.

SENSATIONAL Earnings preparing tax reports. Days, evenings, weekends. Ex-perience unnecessary. Write Auditax, 10775-K Tabor, Los Angeles 64.

YOUR Mail order business now ready. A. S. Spencer, Mokena 6, Ill.

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DON'T Miss our advertisement under Auto Supplies. Faulkner & Assoc.

GUARANTEED Income from ideas, farm, home, business and shop hints. Details free. E. W. Moses, Jr., Blacksburg, Va.

EASY Ways to earn extra income are described in Money-Making Hobbies. 132 projects you can make at home and sell anywhere. 160 pages, \$2.00. Popular Mechanics Press, 200-MH East Ontario, Chicago 11, Ill.

QUICK Cash showing colorful 7" x 11" signs that sell on sight. Slogans, comics, functionals, novelties for every business. Cost 7c; sell for 35c. Send \$1.00 for 15 samples. All Ready, 501-C Piper, Detroit 15, Michigan.

GET Into your own home operated, pleasant, profitable business, working by mail. Everything furnished! Tremendous possibilities in full or spare time. Get exciting details. National, Box 88M, Dorchester 22, Mass.

END Money worries—For good! Robert Colliers lesson tells how. Sample 25c. Income Builders, Hollywood 28, California.

ASSEMBLE And sell electric bed warmers. 400% profit. Altozoo Co., 7811 Guthrie, Cleveland 2, Ohio.

WESTERN Advertiser offers many worthwhile mail order opportunities. 6 months subscription 10c. H. Edlund, 577 Kensington, Los Angeles 26, Calif.

CHURCHES, Organizations. Earn \$100.00 free plus 24 card tables, free delivery. Box 392, Clementon, New Jersey.

WOULD You pay 3%—first \$350 made? Book "505 Odd Successful Enterprises" free! Work home. Expect something odd! Pacific, Oceanside, Calif.

WIN Contest prizes regularly! Others do! 10c brings latest issue "Contest Flyer," other revealing information. Lawrence, 587 Morgan, Camden 4, N. J.

MAKE Extra dollars! Full, spare time, home mail business. Start small, grow. Easy, pleasant. Facts free. Kanick, 261-A East Abbott, Lansford, Penna.

EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

MAKE Money at home as renewal headquarters for all magazines. Big profit in Christmas gift sales. Liberal commissions. Supplies furnished. Catalog free. Write McGregor Magazine Agency, Dept. 509C, Mount Morris, Ill.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 30, Illinois.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

PROFIT With Larson Leathercraft Belts, purses, 100 other ideas. Largest supply in U. S. Catalog 10c. Larson, Dept. C, 824 S. Tripp, Chicago 24.

DOLLARFUL Ideas for you every month in advance—"Voice of Mail Order." Leads the field in exclusive supply sources. Plans for mail order operation; new products, etc. Details free. Advance Publishing Company, Suite 350, 313 East 21st Street, New York 10.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample. Details. National, Ord. Nebr.

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\$50 WEEKLY While learning watch repairing. See ad page 41.

FORMULAS, PLANS, ETC.

TRY Our new Xmas set of 25 money-making candy factory formulas, \$1.00. Golden crisp crackajacks and pop corn cake, etc. Mrs. Jack Walters, Mediapolis, Iowa.

HOT Tamale. Making for profit. Particulars, Box 384, Altus, Okla.

FREE Formula catalog. Anything analyzed \$20.00. Western Chemical, Salem, Oregon.

10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

MILLER'S Modern post-war formulas make products that get the business. Fifty years supplying the best. Literature free! Miller, Manufacturer's Chemist, Tampa 6, Florida.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

FORMULAS For nearly everything. Catalog free. Write Creative, Winnetka, Ill.

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

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PLEXIGLAS. Write for free price list. The Unique Glass Shop, 309 Cowardin Ave., Richmond 24, Virginia.

NEW Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Complete kit only \$3.95 postpaid, or send 25c for exciting new home project manual showing how to get started. Castolite, Dept. P-101, Woodstock, Ill.

WHOLESALE Plastics supply catalog. 10c. Lucite, clear, colored. Metallic acetate, 15 colors. Thick lucite cutoffs, polished blanks for carving. Metal findings, tools, ideas, bargains galore. Quantity prices on casting plastic. Gem-O-Lite, Box 686S, North Hollywood, Calif.

MAGNIFICENTLY Carved plexiglas wall plaques, 2½" x 4" x ¾". \$3.39 pair postpaid. Free plastics supplies catalogue. Craft Plastics, Somerville, New Jersey.

EARN Money with plastics. New book, "Money-Making Hobbies," shows you how. 160 pages, \$2.00. Popular Mechanics Press, 200 E. Ontario, Chicago 11, Ill.

FLEXIBLE Mold makers handbook makes you an expert. Only \$1.00 postpaid. Boruski, 505 Fifth Ave., New York 17.

AMAZING Liquid Plastic kit \$3.25. Embedded photographs, keepsakes, coins. Make solid objects. Clear, colors. Beautiful results in half hour. Inexpensive hobby. Send 15 cents for catalogue. Kristalon Plastics, Dept. M-11, Box 29, Wilmette, Ill.

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", 96c; 1/8", \$1.25; 3/16", \$1.52; 1/4", \$1.80. Colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

INTERNAL Carved roses, orchids, swans, goldfish, butterflies, etc. Jewelry and gifts. Crystal Floral Novelty Co., Bound Brook, New Jersey.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

CHEMISTRY

USEFUL Laboratory item, catalog of chemicals, laboratory apparatus, kits, 10c. Rex Laboratories, 2849-A Birchwood, Chicago 45, Illinois.

CHEMISTRY Kits. Catalog 10c, refundable. Atlantic Laboratory Supply, 21 Wenham, Boston, JP, Mass.

NEW Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

NEW Idea chemical and apparatus outfit for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 15c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester, 7, N. Y.

AGENTS WANTED

STEADY Profits—No investment. Earn \$50-\$75 weekly spare time, \$100-\$250 full time. Plastic aprons, tablecloths, etc. Free catalog. Halliday Co., Dept. M-12, 347 Broadway, Passaic, New Jersey.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 5208, Cincinnati 3, Ohio.

"NO-FOG" Windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee, 140, Akron, Ohio.

STRANGE "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee, 139, Akron, Ohio.

AMBITION Agent's opportunity! No initial investment. No overhead. Hundreds of profitable gifts, household products! 38th year. Toby of Chicago, Dept. 12-P, 14 W. Lake St., Chicago 1, Ill.

BOYS! Earn big money easy, spare time selling brass name plates for neighbor's houses. Write HubStamp, 357-C Congress, Boston, Mass.

MEXICAN Feather pictures. Free particulars! Sample 10c stamps. Sylvia, Apartado 9036, Mexico City.

\$1.00 STARTS You in business. Sell men's neckwear full or part-time. Low investment, big profits. Send \$1.00, receive two sample ties, plus free catalogue, color pictures, selling plan. Radio City Neckwear, Dept. M5, 112 W. 50th, New York City.

BUY Thousands of nationally advertised products direct from manufacturers and distributors. Write for "Buy Direct and Save," Service Publishing, 218-A Investment Bldg., Pittsburgh 22, Penna.

NEW Sensational money maker. You can enjoy continuous, growing income by supplying stores with our shoulder cradle. Free both hands while telephoning. Big profits. Fast direct seller. Write Mission, 4182 P-1 Emerald, Oakland 9, California.

AT Last, sensational invention—Corset stay shield. Stops corset stays jabbing. Best 35c "door opener" ever seen. Send dollar sample card four shields. Hatch Corset Stay Shield, Dept. P-2, No. Sacramento, California.

"GREATEST" Invention since the fountain pen." Pro-Check-Tor, sensational new \$3.95 check protector for use in business or home. Vast untouched markets. Big profit. Write Federal Pro-Check-Tor Company, 627-C Grove, Evanston, Ill.

BIG Money—Fast! Sell quality plastic tablecloths, curtains, aprons, etc. no investment. Factory prices. Free selling outfit. Durever, 2781-G, Atlantic Ave., Brooklyn 7, N. Y.

WONDER Metal mends aluminumware, graniteware, cooking utensils, galvanized iron tubs, tanks, hot water heaters. Every metal article that leaks. Soft like putty. Applied with fingers. Hardens like iron. Cannot be melted. Free information. Agents large size 25c. Home Chemical Manufacturing Co., 143 West Florence, Los Angeles, California.

FREE Samples, and amazing plan, giving you gorgeous dress without penny cost. Rush name today, with dress size. Harford, Dept. B-135, Cincinnati 25, Ohio.

NYLON Uniforms. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P12, 3936 Market, Philadelphia 4, Penna.

PLASTIC Tablecloth covers, curtains, drapes, baby pants, bowl covers and other plastic articles selling like wildfire! Make big money now! Free details. Write L & M Co., Dept. 58-N, 510 St. Charles, St. Louis, Mo.

NO More shoelaces to tie or untie. Sells in quantities. Huge profits. Free folder 105. Henry Rosenstein, 1514 North Eighth, Philadelphia 22, Penna.

LOOK Here! Wanted—Men and women to start in business on credit. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. L-192-PPM, Freeport, Ill.

FAST Selling religious article. Big profit. Write: Universal Sales Co., P.O. Box 663, North Attleboro, Mass.

DREAM And reality: Juiciest plum that ever fell into the lap of agents. Daily net earnings \$100. Capital required, \$15. Sample with convincing details, 50c. If you want big money quickly and easily, made in a dignified and legitimate manner, this is your chance. Emmen Tee, Box 612, Hollywood, Ill.

HOSIERY Sheets, print cloths, etc. Write for prices. Spartan Hosiery Company, Spartanburg, South Carolina.

JEWELRY Factory desires salesmen, distributors, jobbers. Pickcraft, 19 Bank Street, Attleboro, Mass.

AGENTS And distributors wanted for imported jewelry, ukuleles, and banjos. Ferritto's Export & Import, 745 So. Western Ave., Los Angeles 5, Calif.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7.

BIG Profits—Amazing Safe-Lock (on cars with center opening doors) locks rear doors; children can't fall out. Sells on sight, only \$1.00. Send for sample, details on approval. Safe-Lock Products, Box 1071-M (PM12A), Pasadena 1, Calif.

PROFITABLE Sideline (or full time) collecting for doctors by my unique, extremely successful "Persuasion Method." Money-back satisfaction guarantee. Free details. Lamont Chubb, 1119-A Devitor Place, Pittsburgh 6, Penna.

LOCAL Franchises. Power mower—\$49.50. Delivered. World's cheapest. Modern, 7401-EM, North Kansas City, Mo.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

STOP! Want to make money all year round selling a complete line, wool and cotton uniforms for summer and winter wear, shirts, caps, ties, badges, 2000 emblems, personal initialed buckles, belts, and hundreds of other easy-to-sell items? Sales kit furnished. Please write today. Hook-Fast Company, Box 480PM, Roanoke, Va.

SELL "NuSilver Polish and Plating Liquid." Apply with cloth. Nothing else like it. NuSilver, 508-12PM, New York St., Aurora, Illinois.

MUSIC Greeting cards. All occasions. Dorby Music Cards, P.O. Box 738, Morristown, New Jersey.

SENSATIONAL New water repellent rainproof hats, shoes, garments, etc. Big profits. Test sample free. Amhar Industries, Plant 5-B, Huntington, N. Y.

DON'T Miss our advertisement under Auto Supplies. Faulkner & Assoc.

AGENCY Available. Getzol hand cleaner. Instantly removes all types dirt without water! Merely wipe on—wipe dry! Steady repeater. Big profits. Send for free sample, sales plan, proposition. Goetz Petro-Chemical Co., Buffalo 14, N. Y.

SELL Three piece writing sets, fountain pen, ball pen, mechanical pencil. Beautifully boxed. Makes useful gift. Send \$1.25 for sample. Kennedy Sales, Box 178, Richmond, Va.

NEW Shaving sensation. Men wild over this amazing discovery. Sells like wildfire. Great profits. Sample free. Johnson Bros., 730 East Illinois, Morris, Ill.

USED Dresses 18c; men's overcoats \$1.00; skirts 50c. Free catalog. Crown, 164-PM Monroe St., New York 2.

AMAZING Ketchup dispenser! Pumps ketchup out of bottle. Sells fast to housewives, restaurants, stores. King, 55-P Oleander, West Springfield, Mass.

AGENTS! 100 Brand new products. Confidential bulletin monthly. Publishers, Gardenville 8, N. Y.

NEWEST Money-making sensation, miniature authentic replicas, police and firemen's badges also pocket pieces, key chains. Write for descriptive folder. Hook-Fast Specialties, Dept. 20, Box 1425, Providence, R. I.

LOOK! Make money all year round selling personal initialed individualized belts, buckles, cap badges, tie holders, complete line police and firemen's badges, 2000 emblems to choose. Big profits, whole or part time. Please write today special outfit offer. Hook-Fast Specialties, Box 1425, Dept. 6, Providence, R. I. Established 1926.

SELL New stock signs to all kinds businesses. Set of eight sell for \$1. Sample set only 50c postpaid. Al Hawkins Co., Sioux City 7, Iowa.

SELL New clothing. Lowest prices. Operate from home, auto, store. Enormous profits. Big catalog free. National Mail Order, 1219-A So. Jefferson, Chicago 7, Illinois.

MEXICAN Feather pictures Christmas novelty. \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P, Apartado 762, Mexico City.

SELL Big money-maker to men and women. Easy handwork makes fast-selling useful articles. Sunmade Company, Brockton 64, Mass.

FREE Nylons given if Kendex hosiery runs or snags! World's only women's hosiery sold with written guarantee amazing everybody. Mere words could not express unbelievable money-making opportunity. Fantastic earnings become reality. Armstrong earned \$202 in 9 days. Watkins sent 92 orders in one day. Imagine replacing hosiery free regardless of cause—whether use or abuse! Truly sales dynamite for terrific profits. Even if you never sold before, three magic words: "Guaranteed Against Everything" will open doors for you—make women listen and pour money in your pocket. Nationally advertised in Life, Ladies Home Journal, Saturday Evening Post, McCall's and Woman's Home Companion. Awarded Seal of Approval by Good Housekeeping. 75 million readers will see Kendex advertising to help you make quick sales and big money. Complete line from sheerest 15 denier 51 gauge to heavy 70 denier service. Sizes 8½ to 11½; lengths 28 to 35 inches; latest fashion colors plus white; full fashioned seamed and seamless. No competition because Kendex nylons are not sold in stores. Also complete line men's hosiery actually guaranteed for one full year or replaced free. Nothing like this anywhere. Includes rayon, nylon, lisle, wool, cotton, mixtures etc. All styles, patterns, colors, prices to please everybody. 200,000 pairs constantly in stock for fast delivery. Thousands shipped daily. Over 30 years in business. You need no money or experience. Nothing to pay now or later. Just show free outfit. Write orders. We deliver and collect. Big advance cash plus huge bonus. Earn money spare or full time—exclusively or as side line. No restrictions. Become manager—appoint others to sell for you—earn steady income on their sales. Man or woman, young or old, experienced or beginner, you can make money and friends writing orders. Everything you need is furnished free, including sales books in color, samples of hosiery materials etc. Simply write your name and address on postcard and make money next week with money-making outfits sent free and prepaid. No obligation. Kendex Company, Babylon 33, N. Y.

AGENTS. Sell finest food products direct to homes. Successfully sold for 25 years. Big profits. Powerful combination sale plans make sales easy. Permanent repeat business. Samples furnished. Live territories open to distributors. Mother Hubbard Products Co., 4139 Grand, Dept. P.M., Chicago.

BE Renewal headquarters for all magazines. Big profit in Christmas gift sales now. No experience, no capital needed. Free catalog tells how. Write: McGregor Magazine Agency, Dept. 509A, Mount Morris, Illinois.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Free sample kit. Printcraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell catalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235 (L), Pittsburgh 30, Pennsylvania.

FREE Samples. Big profits showing amazing Glow-in-the-Dark specialties. House numbers, pictures, plastic novelties, religious and nursery objects, etc. Large manufacturer. Madison Plastics, 303 Fourth Ave., New York 10, N. Y.

SEWING Machine electrification kit. Nationally advertised. Has Good Housekeeping Guaranty Seal. Can be demonstrated and sold in 5 minutes. Make at least \$5 per sale. For complete details write today to Brownell Distributors, Inc., Dept. PM, 308 Canal St., New York 13, N. Y.

FREE Water and our concentrates, make flavors, lotions, shampoos, 125 products, labels, bottles supplied. Qualco, E20030 Russell, Detroit.

MAGIC Cleaner—Laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 4642 No. Central, Chicago.

GOLD Lacquered window sign letters. Large sizes penny each. New tools. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

PHOTO-Salesmen-agents. Sell beautiful hand-colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

HERE'S A hot item. 150% profit on every sale. Tops makes whipped cream from ordinary top milk—a secret of famous chefs and confectioners. Sensational seller at 25¢ to every house, restaurant, fountain. Good repeater. Send only \$1.00 for trial dozen. Postpaid. Flett's Fine Foods, 4611 Judge St., Norwood, Ohio.

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BOYS Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample, Write Dept. 55, National Engravers, 214 Summer, Boston, Mass.

HIGH-GRADE SALESMEN

PLASTIC Coated playing cards—Suits in four different colors. Experts say "They're foolproof." Samples—Canasta with rules and score pad \$1.50, retail \$2.25. Bridge or pinochle double decks \$1.50, retail \$2.25. Singles 75c, retail \$1.15. Other specialties plain or imprinted. Cobb, Dept. P. 12, Box 34, Elmwood Station, Omaha 6, Nebraska.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7 x 11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 506, New York City 7.

SALESMEN: New amazing mop. Guaranteed not to drip or splash. Self wringing. No bending or stooping. Wash or waxes floors. Cleans walls, ceilings and rugs. Low price makes it sell quick. 30% Comm. Magic Mop, Dept. 190, Chicago 17, Ill.

WRITE 3 Words—Collect \$9.95 on 10-second demonstration to merchants. Write on glass with Amazing Magic Crayon. Presto—5-color advertising message takes fire, glows like brilliant neon. Three sales daily bring \$29.85 profit. Rush postcard full details, complete sales kit—free. Maximus Co., 125 W. Hubbard, Dept. LC-812, Chicago 10.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-129, 7530 Greenwood, Chicago.

SELL Adding machines for \$12.95! Make 49%! Make over \$30.00 a day selling nationally advertised adding machines for only \$12.95 complete. They're desk model portables, precision built business machines, fully guaranteed. Easy to operate! Amazingly easy to sell! Send for life-size color photo and full details. Write today to Lightning Adding Machine Company, Inc., Dept. ZO, 543 South Spring Street, Los Angeles 13, Calif.

OVER \$500 Weekly average several weeks for Maurice and Ruffo. \$250 weekly common, selling patented tool. Demonstration 2 min. Inexpensive. Prospects everywhere. Exceptional sales proposition. Palcoseel Co., Ltd., Massena PM1, N. Y.

MANAGERS, Representatives for Cinderella fashions. Write Mr. Huff, Regional Manager, 129 Joralemon St., Brooklyn, New York.

VENETIAN Blinds—Good profits for dealers. Mohawk Ven. Blind Mfg. Co., 207 Bridge St., Cambridge, Mass.

EVERY Salesman should have Scratching With a Wishbone or That Itch to Sell. Unique, practical, whimsical, illustrated booklet on salesmanship. 50c. Excellent for direct mail. Bill Hobbs, Morrisville, Penna.

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SALESMEN: Take orders for Laminite signs. No electricity yet glow like neon. Creating sensation. Big advance comm. No investment. Laminite, 1544 Cortland, Chicago 22.

SALESMEN Making \$50.00 to \$100.00 per day selling our glycol vaporizers, "prevents catching colds." Electric fans, sump pumps. Self sticking advertising tape. Write Universal Fan Co., Inc., Peru, Ind.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

BIG Money taking orders. Shirts, ties, socks, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

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FREE Bible correspondence courses—Adult, junior, offered by international radio Bible broadcasters. Write: Voice of Prophecy, Box 55, Los Angeles, California.

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SCIENCE Of memory simplified. "The Art of Memory Development" free. Memorology Studio, 2016-P Sunnyside Ave., Chicago 25, Illinois.

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PHOTOGRAPHIC Mind with Super-memory. Write Thor Books, P-12, Box 1210, Chicago.

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SAVE Hundreds of hours yearly! Learn how to read up to 100% faster! Rush postal for free home test, details. Brownson, 9111 Hoyne, Chicago 20.

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FRESHLY Compiled names. Many classifications. Write W. Nothern, Lake City, Arkansas.

LETTERS Remailed 25c (coin). Charles Henkelmann, 1535 L, Lincoln, Nebraska.

REMAIL Your letters from Lincoln or Omaha, Nebraska. 25c each. Bouges, 3648 Folsom, Lincoln, Nebraska.

SPECIAL SERVICES

SELL By mail. Offers 10c. Savell Sales Company, Maspeth 2, New York.

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LEARN Professional lettering. Easy, experience unnecessary. Amazing mechanical process. Complete instructions, 75 alphabets, 250 designs \$1.00. Major-Art System, 3510-Y Palmer, Chicago 47.

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CARTOONS Drawn to your gags \$1. Cartoonscribe, 232 Grant St., Cincinnati, Ohio.

9 ALPHABET 3 Numeral pattern sets and catalog, \$1.00. Sign Letter Distributors, P.O. Box 101, Mineola, N. Y.

CHALK Talks. Laugh producing program, \$1.00. Catalog 10c. Balda The Cartoonist, Oshkosh, Wisconsin.

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ADVERTISE: 24 Words, 40 newspapers \$3.50. Lists free. Advertising Bureau, 10511-C Springfield, Chicago 43.

MAILORDER Buyers names 1c each. Minimum \$1.00. Ideal Name Service, Park Ridge, Ill.

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AVOID Costly advertising mistakes. Get enlightening Ad-Guide and Ratebook leading newspapers, magazines, mailing lists, 10c. Chicago Advertising Agency. (Established 1900), Chicago 4.

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REACH Spanish-speaking mail-order buyers. Great new market for your merchandise. Your classified ad in the Spanish Edition of Popular Mechanics will bring you some nice business from this new field. Rate only 25c per word. Circulation 100,000 copies. Mail a trial ad right now. Popular Mechanics Magazine (Spanish Dept.), 200 E. Ontario Street, Chicago 11, Ill.

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TYPEWRITERS \$17.50; Duplicators \$9.75; adders \$12.50; burglar alarms \$2.95; air purifiers \$6.95. Meier's, 118 Spruce, Wichita, Kansas.

RECONDITIONED Typewriters, printing devices. Write Dixie Service, King, N. C.

ADVERTISE. Increase business. "Printomatic" selffeeding "mimeograph" post card duplicator prints, reproduces, thousands anything typewritten, handwritten. \$13.50. Literature. Pittsburgh Typewriter Company, 336-3 Fourth Avenue, Pittsburgh 22, Penna.

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BALL-POINTS Refilled. Send cartridge, 20c. Bird, 2413 Madison, Wilmington, Delaware.

LINE 20c; 2-35c; 3-50c. Stamp Works, Auburn, Nebraska.

PRINTING OUTFITS AND SUPPLIES

PRESSES, Type, supplies. Lists 5c. Garza, 98 Pleasant, Cambridge 39, Mass.

PRINTING Presses, type, supplies. Send stamp for details or dime for complete illustrated printer's supply book and samples. Kelsey Corp., J-11, Meriden, Conn.

PRESSES, Type, cabinets, supplies. List for stamp. Lincoln Press Company, 220E Hartwell, Fall River, Mass.

PRESSES, Type, supplies. Catalog 10c. Printers Supply, 211, Springfield, Missouri.

MAKE Your own rubber printing cuts. Self molding process. Plexirubber, Argyle 1, Wisconsin.

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PRINTING Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

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MIMEOGRAPHING Specialists. Any copy. Reasonable. Mailers Service, Box 606-H, Chicago 90, Illinois.

MIMEOGRAPHING—Any copy; bargain prices! Topical Emprire, 1527 Highland, Box 42-P, Louisville 4, Ky.

1000 EMBOSSED Business cards \$2.75 prepaid. Avery Printing, 112-OS Elizabeth, Wichita 12, Kansas.

1000 BUSINESS Cards \$1.85 prepaid. Cpr. Sales, Williamsbridge, Bronx 67, N. Y.

MIMEOGRAPHING By expert, reasonable, prepaid, free sample, prices. Arnold, 1305p Gough, San Francisco 9, Calif.

EMBOSSED Business cards, 1000, \$3.45 postpaid. Samples. Spada Enterprises, 10C Lexington, Wethersfield 9, Conn.

125 HAMMERMILL Letterheads 8½ x 11 \$1.00 postpaid. Envelopes, cards same. Odom, Box 9345, Tampa, Florida.

GLO-BRITE Letterheads "increase" business. Beautiful combination colors. Samples free. Rienzi Press, 24 North 7th Street, Newark 7, New Jersey.

100 8½ x 11 HAMMERMILL Letterheads and 100 envelopes \$1.85. Herbert Hudson, Centredale, R. I.

MIMEOGRAPHING, 250 8½ x 11, \$2. Samples, prices, free. Mimeographing, Madison, Tennessee.

1000 BUSINESS Cards \$2.50. Prepaid samples free. Reliable Print Shop, 905 E. Jefferson, Louisville 6, Ky.

QUALITY Printing! Free price list. Nationwide Printing Company, Dept. PM, 2337 Bath Avenue, Brooklyn 14, N. Y.

PRINTING? Lowest prices. Samples free. Churchill, Box 194A, West Medway, Massachusetts.

QUALITY Printing. We specialize in publications, newspapers, tabloids. Send copy for estimate. Bagby Printing Co., Georgetown, Ohio.

SEND 10c Now, for our 48 page 1949 price list—refunded first order. McCall Press, 1326 South 27th, Omaha, Nebraska.

500 3/4x2 1/4 FOUR Line gummed stickers 35c; red border 50c. Moritz Printery, Saginaw, Mich.

MIMEOGRAPHING—Letters, pricelists, formulas, instructions. Lowest prices. Lem's Letter Shop, 5710 Stanton, Detroit 8.

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HERMAN Lewis Gordon, registered patent attorney. Patent investigations and opinions. Warner Building, Washington, D. C.

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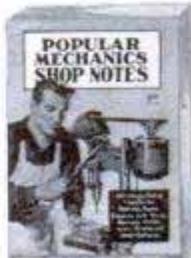
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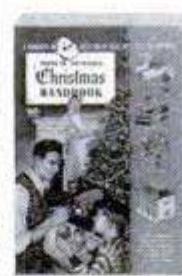
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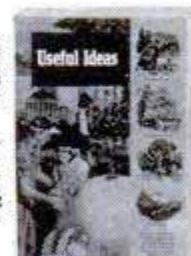
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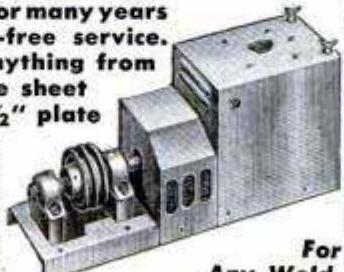
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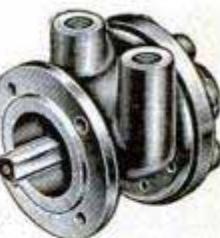
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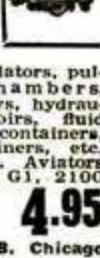
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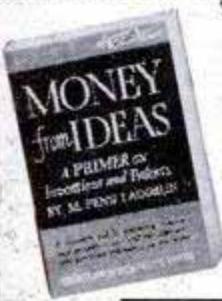
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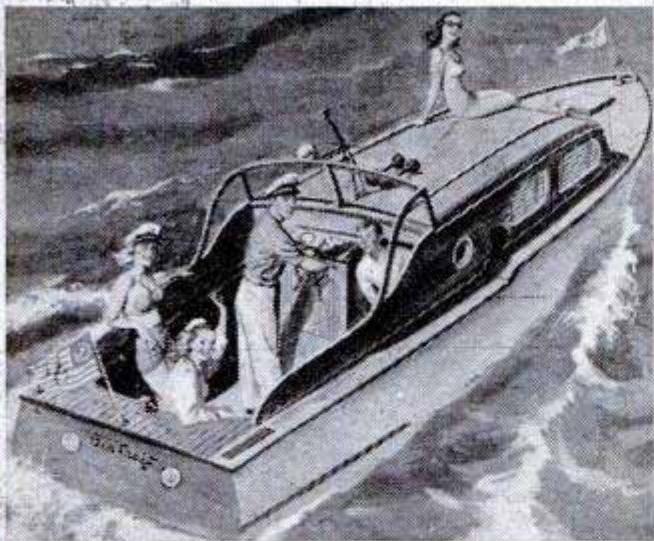
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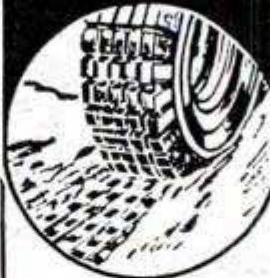
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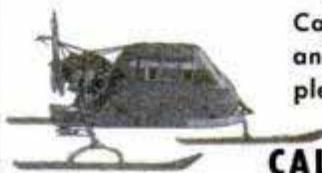
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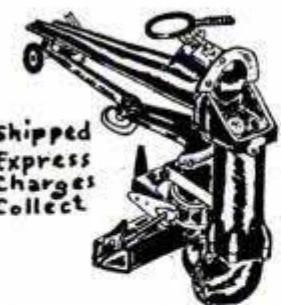
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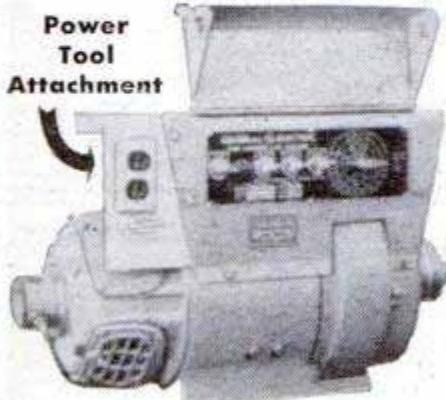
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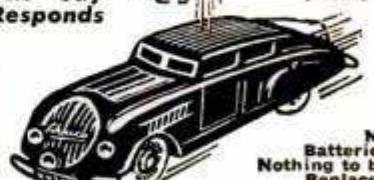
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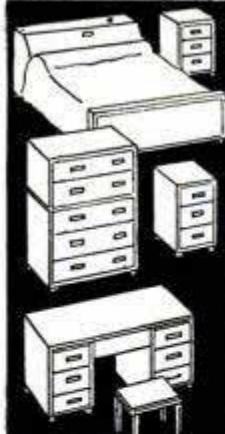
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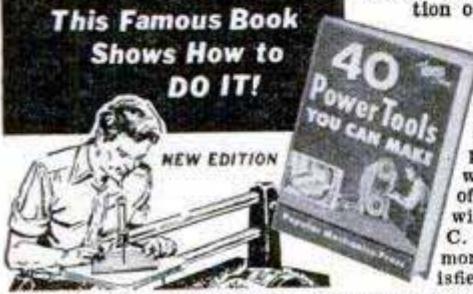


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Partial Contents

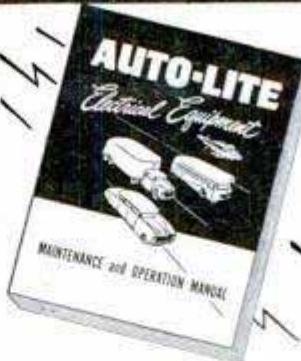
How to Select a Xmas Tree. Exterior and Interior Lighting. Rotating Xmas Trees. How to Make Your Own Greeting Cards. Helpful Hints on Home Decoration. Tips for the Holiday Hostess. How to Make Gifts for All Ages. The Story of Christmas. Christmas in Other Lands. Centerpieces, etc. Gift Wrappings. Christmas Games. How to Make Candles. Xmas-Tree Ornaments.



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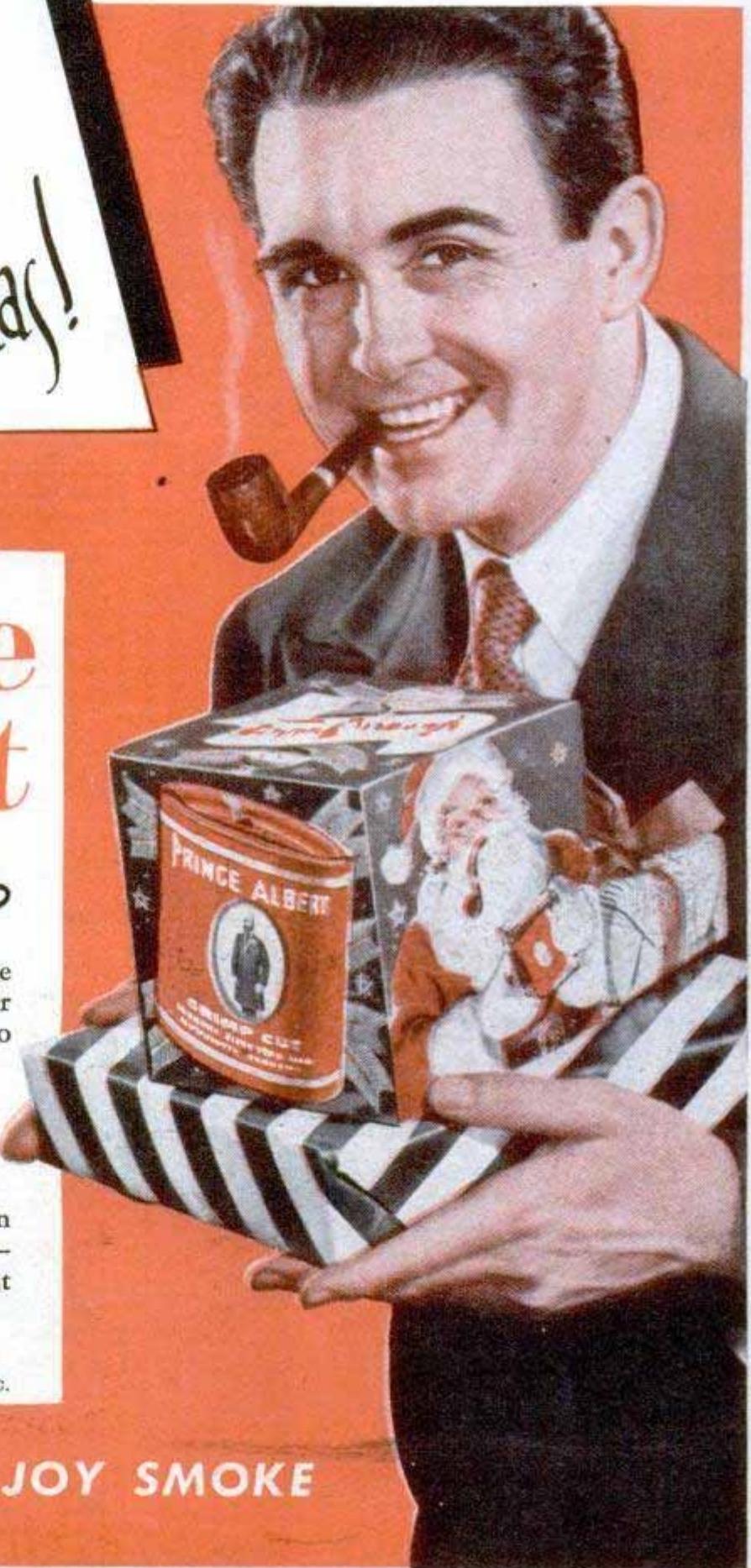
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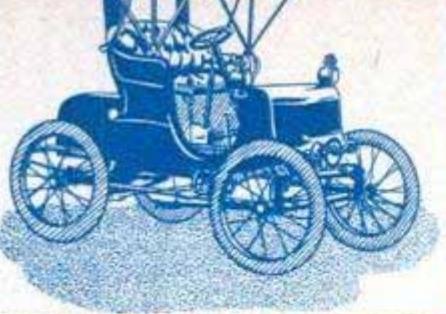
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POPULAR MECHANICS

DECEMBER
1949

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 92 NO. 6

The New Breed of Sports Cars

SPORTS-CAR enthusiasts who have preferred European automobiles because they could find no domestic makes that satisfy them are beginning to build cars for themselves.

Scores of owners have spent from \$2500 to \$20,000 each to build the kind of cars they desire. One manufacturer of race cars, in answer to the demand, has toolled up for limited production of a sports car of his own design.

What is a sports car, anyway?

It's a car, the enthusiasts tell you, that has outstanding speed, steering and roadability characteristics. It's a car that's a pleasure to drive. It's useful around town, safe on the highway, and also is suitable for competition in the special road races that presently are coming back in popularity.

The trouble with American stock cars, a sports-car driver complains, is that they are miniature busses designed for a soft ride and for easy parking by a

By Thomas E. Stimson, Jr.



Rear-engine sports car has European lines and is powered by a Buick engine; without windshield, the car stands 39 inches tall. Engine in car below is placed at exact center of gravity. The rear-compartment deck is raised by hydraulic cylinder to reach engine or the fuel tank





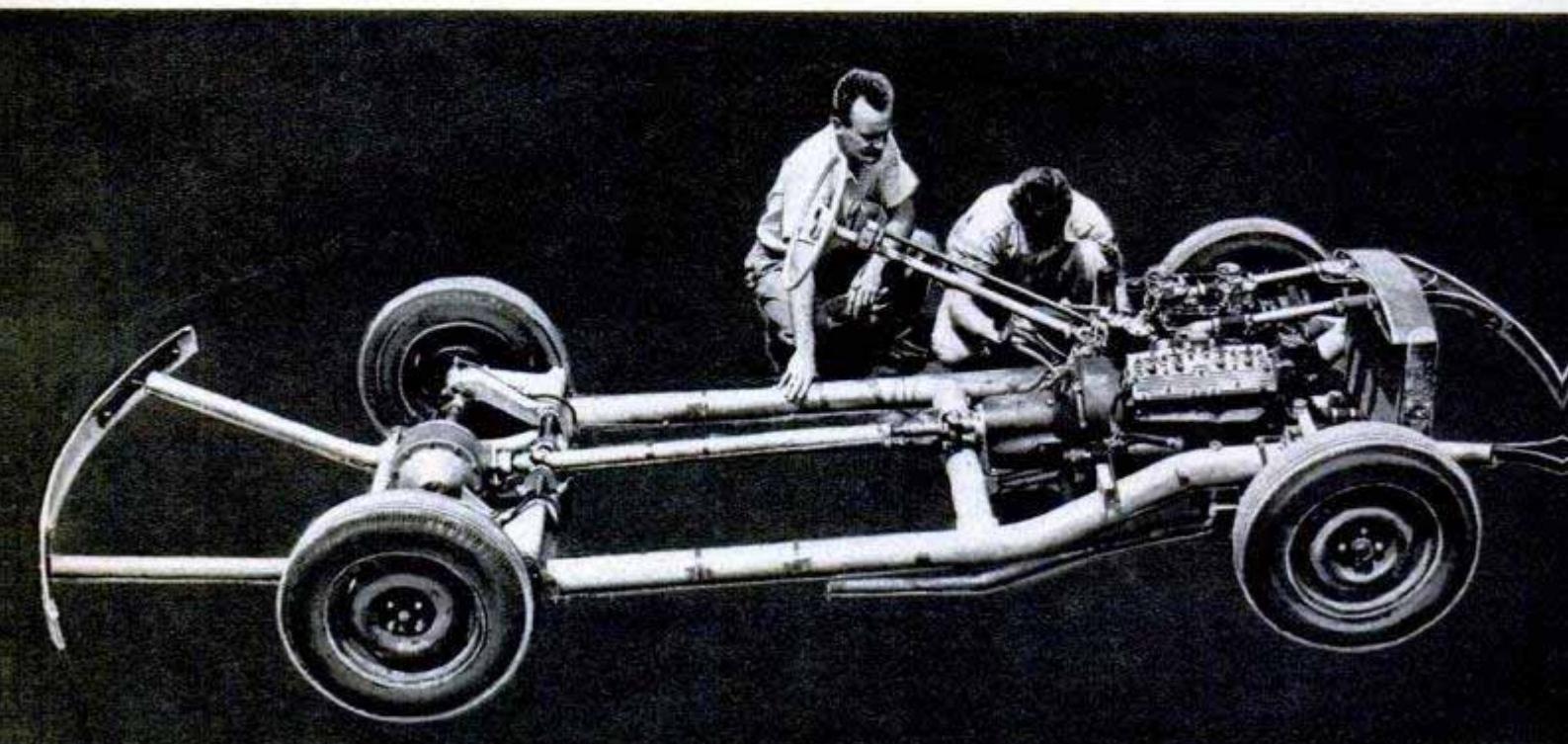
A low-slung British Jaguar rounds a sharp curve on a paved mountain road in a California sports-car race

weak woman. They have high centers of gravity and most of the weight is suspended between the front wheels. They have extreme steering ratios. As a result, they are safe only at moderate speeds and they can't turn a corner unless they are braked almost to a crawl. Many European sports cars of less than half the horsepower can walk away from them in traffic or on a mountain road.

Much of this is true, of course, because

stock-car designers have had to sacrifice some things to provide other qualities that the majority of buyers desire. Until now the demand for high-performance sports cars has been satisfied by importations from abroad. England, France, Italy and Germany all have produced low-slung, lightweight cars that fall into this category. The Jaguar, with an engine the same size as the standard Chevrolet, has been clocked across a flying mile at 132.6 miles per hour.

Chassis of Edwards sports car shows tubing used as frame which serves as auxiliary 13-gallon gas tank



The Talbots, the M.G.s, Alfa Romeos and BMWs, among others, have outstanding roadability. Many of them have supercharged engines. In one 1000-mile road race in Europe, the winning car, powered by a specially tuned supercharged engine that was mounted in a closed streamlined body, won at an average speed of 108.9 miles per hour.

Of all the foreign cars the little M.G. roadster, of which there are hundreds in the United States, has done the most to revive interest in sports cars in this country. Owners of the cars form clubs and engage in hill climbs and in races over rough roads that are full of obstacles. Full-fledged road races are usually community events and are conducted with the permission of town and state officials because it is necessary to close off and barricade the approaches to roads that are being used as the course.

One of the biggest road races held in the United States since the war attracted nearly 50,000 people. The race was held at Watkins Glen, N. Y., and consisted of eight laps around a 6.5-mile course that was especially selected to include all types of road surfaces from concrete to dirt, sharp corners, steep hills, bridges and all the other ordinary hazards of cross-country touring. Thirty-five cars competed and the race was won by an Alfa Romeo sedanette that averaged 63 miles per hour, having been timed at 103 miles per hour on one straightaway. A redesigned and rebuilt Buick took second place and all the other winners were foreign cars.

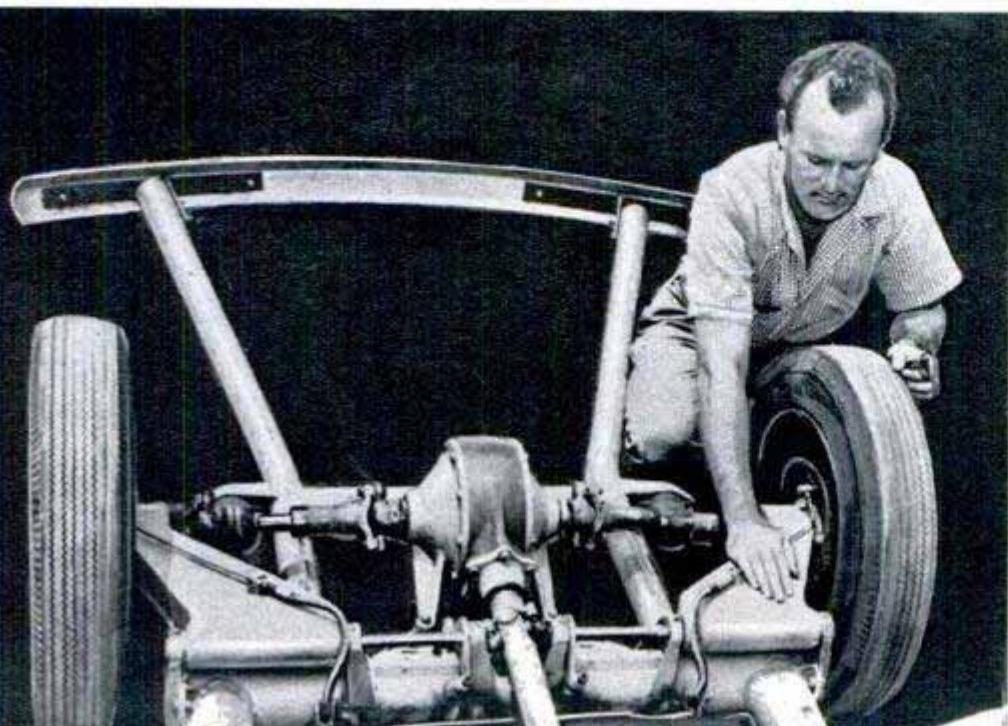
Possibly the toughest road race of all time was held last year, not in Europe or in the United States but in South America. One hundred and thirty-six drivers, mostly in stock cars, started from Buenos Aires and raced north to Caracas, Venezuela.

Then, after a long boat trip to Lima, Peru, the cars that were still in the competition raced down part of the west coast and back over the Andes to their starting point. The total distance was 11,800 miles, very little of which was on pavement or improved roads. The winners split prize money of \$100,000 between them.

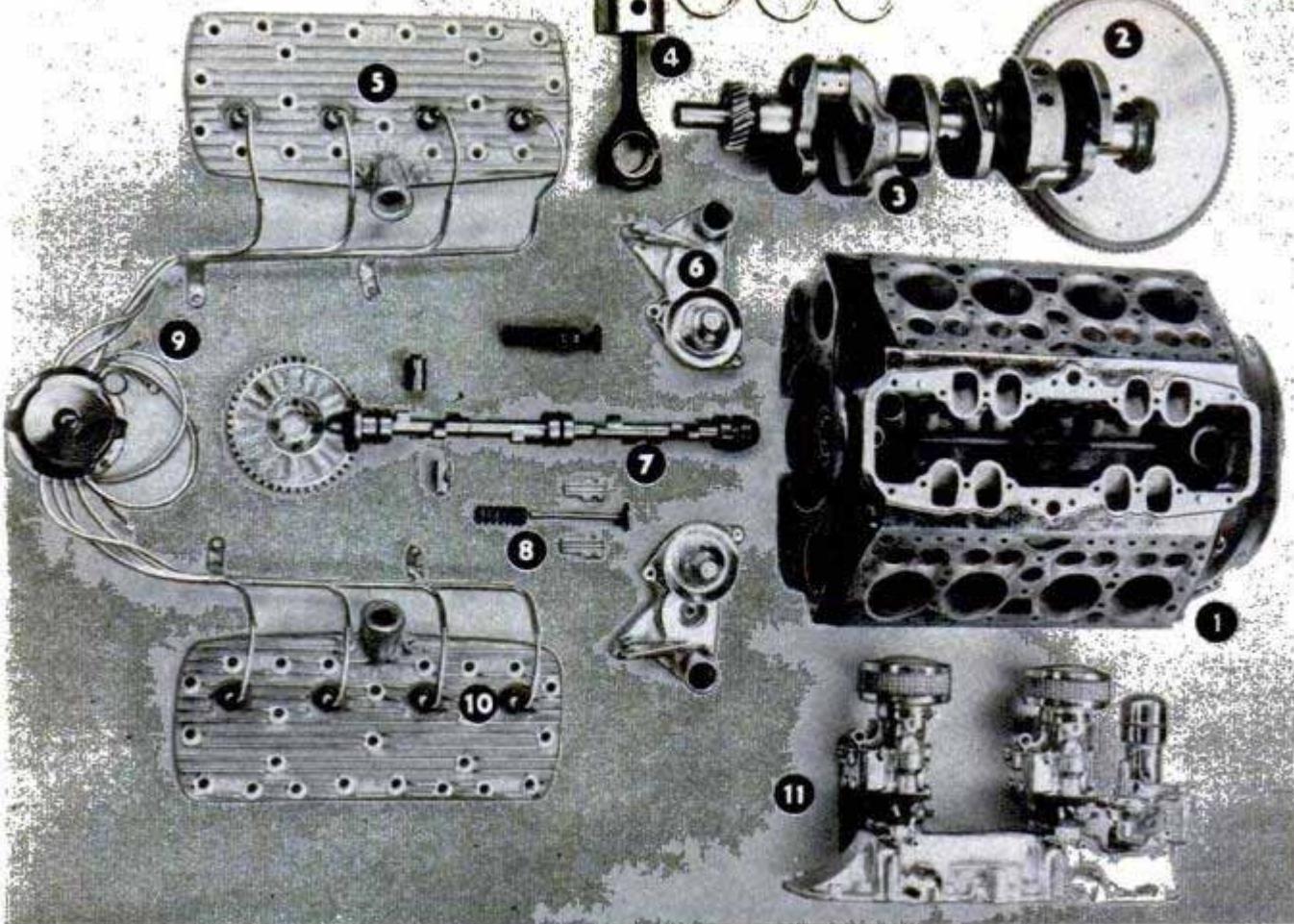
The American hot rods have been called sports cars and some of them do approach that classification. Most of them, however, are designed primarily for racing wide open against time on a straight and level course. Usually their engines are highly stressed and are tuned for peak efficiency at maximum revolutions per minute. They are inefficient at ordinary road speeds. Too, most of the hot rods steer and corner very poorly by sports-car standards. In competition with true sports cars, the hot rods usually turn over or spin off the course if the driver is heavy footed; if he drives more conservatively, he falls way behind the leaders.



Quarter-scale model of the Edwards car provides full-scale body measurements for the engineers. This model shows top removed and rear seats concealed for use as a sporty low-slung roadster



Left, trailing-arm suspension system and torsion-bar springs of the Edwards car are shown. Differential is fixed solidly to frame to reduce unsprung weight of this carefully built auto



This shows what happens when an 85-hp. stock Ford V-8 is reworked to deliver up to 190 hp. 1—Block is ported and relieved to permit easier flow of fuel and gases. 2—Lightweight flywheel. 3—Counterbalanced crankshaft. 4—Matched connecting rods and pistons with special bearing inserts. 5—Custom-built heads with a compression ratio of up to 11 to 1. 6—Chromed water pumps (for looks). 7—High-grind camshaft. 8—Adjustable tappets with oversize valves and guides. 9—Special racing ignition system provides hot spark at all r.p.m. 10—Racing spark plugs. 11—Special intake manifold to which are attached twin carburetors, the fuel pump and a fuel strainer.

What the American sports-car designers are achieving is a new idea in automobiles. They are combining the sure-footedness of the typical European car with the roomier body and good seating capacity of American cars. Most of the American-built sports cars are roadsters or convertible coupes, the convertibles having a hard or soft top that may be completely removed. A short wheelbase of 100 inches or a little more is preferred even though the body itself is much longer. The motor must have plenty of power. Steering and suspension are especially important and the car must be stable at all times.

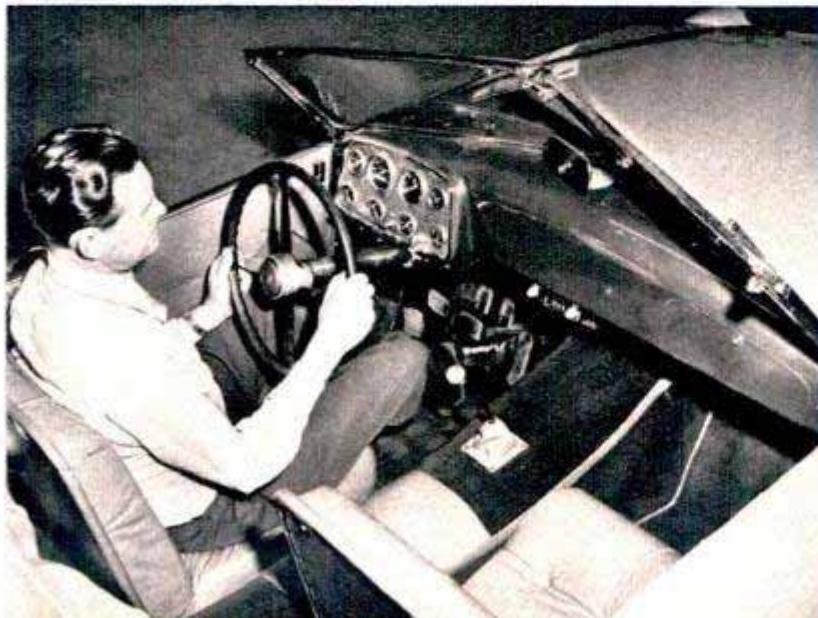
Much of this development centers in southern California. One typical roadster, built by Paul Omohundro, has practically a stock Mercury chassis that is powered by a Cadillac engine and that supports a special body of sweeping lines. Another car, designed and built by Norman E. Timbs, automotive engineer, is a rear-engine roadster that is powered by a Buick engine mounted exactly at the center of gravity, behind the driving compartment. The chassis consists of welded aircraft tubing. The aluminum body was made up on a wooden pattern and was welded together.

It is hinged in the center and the rear section is raised by a hydraulic cylinder to allow access to the engine. Steering, brakes and other equipment are standard Mercury parts. The car has a 117-inch wheelbase and is 17½ feet long over-all. Top of the windshield is 47 inches off the ground. Heavier than most sports cars, it weighs 2500 pounds and has an estimated top speed of about 120 miles per hour.

One of the best known sports cars is in limited production by Kurtis-Kraft, Inc., of Los Angeles. Designed for ease of maneuverability, comfort, safety and high speed, it incorporates many of the ideas of Frank Kurtis, head of the company and well known as a designer and builder of midget and Indianapolis race cars.

The car is a low-slung roadster on a 100-inch wheelbase and is 169 inches over-all. It stands 51 inches high. Power plants of from 80 to 160 horsepower are available at the buyer's option and the top speed is dependent on the power plant. The side frames extend to the outside of the car and become part of a full wrap-around bumper assembly. All fenders and body panels, with the exception of the doors, are made

(Continued to page 248)



Top, German engineer rebuilt a Volkswagen for racing. It has four carburetors and a top speed of 80 m.p.h.

Just below the Volkswagen is a speedster composed of a reworked Mercury chassis and a powerful Cadillac engine

Third from top is Kurtis sports car which can do 100 m.p.h. with a small engine. Designer Kurtis is at the wheel

Left, Kurtis demonstrates telescoping steering-wheel column that allows driver to move wheel to desired position



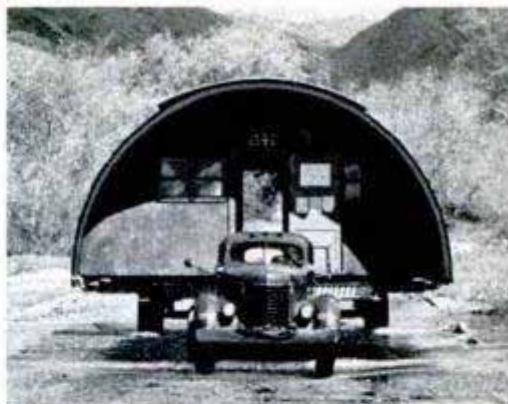
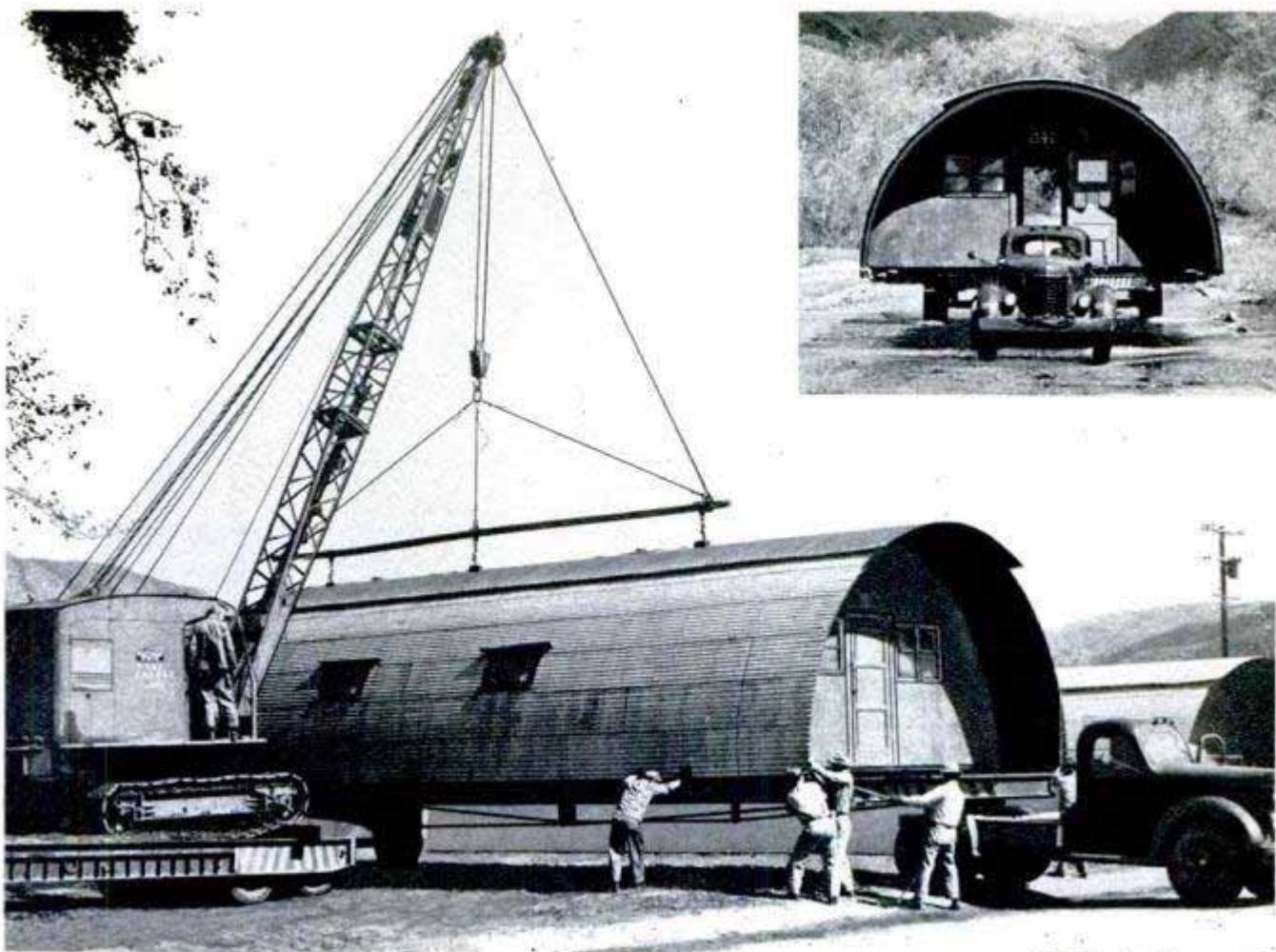
WIRELESS TREE LIGHTS eliminate all fire hazards due to faulty insulation on Christmas-tree light strings. The ultraviolet-ray lighting set decorates the tree with ornaments that glow without wires or heat. The ornaments, of various shapes and colors, are made of plastic that becomes fluorescent when struck by rays from an ultraviolet bulb at the base of the tree. Because there is no wiring to limit placement of the "lights," a more balanced decoration is possible. The ultraviolet bulb is mounted in a hooded fixture that can be used throughout the year with a standard fluorescent tube to provide illumination over the sink or desk. The new system cuts down the cost of lighting, too, because the bulb consumes only 15 watts.

TUB-TYPE HOLDER (below, left) supports a Christmas tree in 12 quarts of water. The original water supply in the tub will last through the holiday season without replenishing. The holder measures 15 inches in diameter at the base and is seven inches high. Three setscrews bite into the tree trunk to hold it in place. According to the U.S. Forest Service, a tree is less flammable if it is cut off diagonally and then placed in water reaching above the cut surface



PLASTIC CLIPS (below) permanently attached to new Christmas-tree lamp sockets seal out tinsel and other decorations that might cause short circuits. No metal is exposed anywhere on the socket. The clips also serve as clamps to hold the sockets to the tree. The lights are available with either incandescent or fluorescent bulbs.





U.S. Marine Corps photos

Using a crane with a spreader bar, Marines and civilian workers hoist a Quonset onto the special trailer. Inset, the truck, trailer and 10,000-pound hut even had to ford shallow river beds during the trip. Below, the trailer is more than 55 feet long and 12 feet wide. Small trucks warned motorists of "house on wheels"



Moving Day for Quonsets

Marines, faced with the problem of moving Quonset huts 22 miles to a new site, solved it with typical ingenuity—they built a trailer big enough to carry a complete building. After hoisting a hut aboard the trailer with a crane, they towed it down the highway to Camp Joseph H. Pendleton at Oceanside, Calif., and dropped it on its new site. The estimated cost of moving each

hut was \$75. The old method of moving a hut by disassembling and reassembling cost \$576. The trailer, built in eight days, measured 55½ feet long by more than 12 feet in width. It supported the 10,000-pound huts with ease.

By measuring sediment layers, which accumulate at a rate of about $\frac{1}{4}$ inch per 1000 years, scientists have estimated that the Atlantic Ocean is half a billion years old.



Look out...
AVALANCHE!

← Party of skiers prepares for three-mile downhill run from the summit of Mt. Ogden, Utah. Such high, steep, open slopes as this make avalanches more frequent in the West than on the New England slopes



U.S. Forest Rangers check potential slide areas very carefully, marking them if the danger warrants. This ranger is carrying signs up the slope for posting

IT WAS TYPICAL avalanche weather—successive storms followed by prolonged cold. The fresh snow had not yet settled and the surface was extremely unstable. All of which meant that skiing at this particular winter resort in the Rockies had to be restricted to certain slopes that were known to be safe.

"What about Blank Creek Run?" Bill Smith and Joe Anderson, two good skiers, asked the instructor.

"Have to test it first."

Four men on hickories—two skiers, an instructor and a ski patrolman—climbed a ridge to the head of Blank Creek Run.

"I'll make a quick test," said the instructor. "Wait until I'm off the slope."

He skied swiftly into the danger zone, turned sharply and headed back. But Bill and Joe failed to follow orders. They, too,

zoomed onto the slope. Silent as death itself, it gave way under the weight of the three men. A great river of snow began to race down the canyon.

"Look out—avalanche!" shouted the instructor and barely regained the safety of the ridge. Bill skied straight across the hazardous slope and reached the other side. But Joe made a mistake that cost him his life. He tried to outrun the avalanche by schussing straight down. The express-train speed of the slide caught him, carried him over a cliff and buried him 15 feet deep. He died of suffocation before rescue crews arrived.

With 5,000,000 Americans addicted to winter sports, research on avalanches in the United States has become important. The U. S. Forest Service, with supervision over 90 percent of the skiing areas in the

U.S. Forest Service photos

The hard work of shoveling and a big repair bill were enough to teach this pair a lesson. Next time, they won't park their car in a "closed area." A slide has completely buried the car

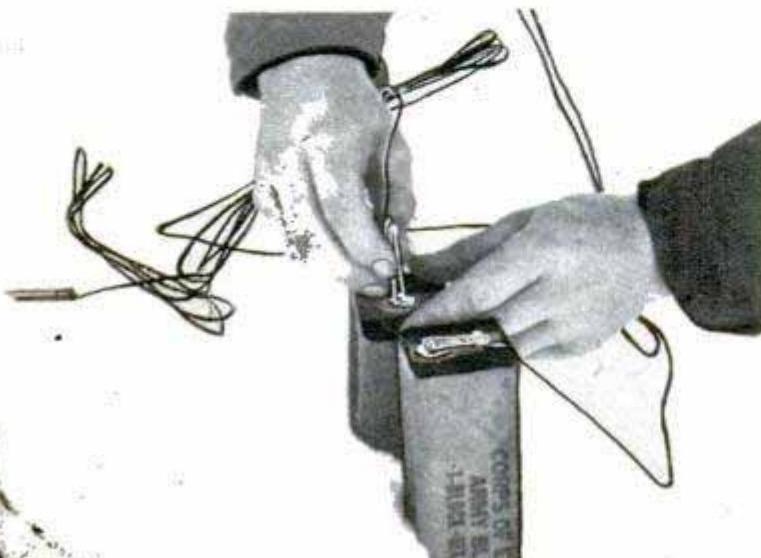




Ordinarily on duty towing skiers on Mt. Hood, the Sno-Motor (see cover) is ready when an avalanche strikes to speed rescuers wherever they are needed



Above, with this portable radio, the rescue party calls for more supplies and help. Below, avalanches can be set off harmlessly with a charge of tetrytol



western states, has just completed a 10-year study of this powerful, complex force of nature.

In charge of the project have been Montgomery M. Atwater, snow ranger at Alta, Utah, and F. C. Koziol, supervisor of the Wasatch National Forest. They have written a 96-page monograph for the Forest Service, "The Alta Avalanche Studies."

Alta's excellent skiing slopes were chosen as a "laboratory" not because they are more dangerous but because this was the first true alpine ski area to be developed in the United States and because detailed records of snowslides have been kept in this section for the last 75 years.

Avalanche forecasting is not yet an exact science — the hour, location and violence cannot be pin-pointed. But the green-uniformed rangers of the U. S. Forest Service, using research done at Alta, can warn you when to stay out of areas of probable slides.

Exactly the same conditions of terrain and climate that produce the finest skiing also produce avalanches. As a general rule, the greater potential danger exists on the steep, high-altitude, open slopes of the West rather than on the gentler, wooded slopes of New England and Eastern Canada.

Avalanche terrain depends upon grade, shape and surface of the land. Grade is most important. Unless the slope is 25 degrees or steeper, there is little danger of avalanches. Next comes shape. Convex slopes are more dangerous than concave because snow settling on a bulging surface is under tension. Third is surface. Areas where the ground is rough, boulder-strewn or covered with brush will hold the snow pack better than a relatively smooth or grass-covered slope. Tree cover is important also. Recent studies by Swiss researchers have shown that reforestation is a good way of reducing snowslides.

It is a mistake, however, to gamble entirely upon trees. They are virtually use-

less against certain types of avalanches. For example, a light, dry powder snow will flow like water or sand around tree trunks. Two of the most devastating slides at Alta in recent years originated in forested areas.

Size also is a factor in snow avalanches. A wide slide descending a short slope does less damage than a narrow slide on a long slope. It's the difference in momentum between a milk truck nudging into your car at two miles per hour and a "hot rod" smacking it at 60.

Contrary to general opinion, avalanche hazards do not exist straight through the winter from the first flurries of snow in November to the last lingering patches in April. Danger from avalanches is like that from tornadoes—greatest at different times of the year and in different locations. Trained observers watch for telltale signs of avalanches and take measures to combat them.

A major storm is the principle direct cause of an avalanche. This is just another way of stating the basic formula worked out by Atwater and Koziol: "Sufficient snow in a favorable location."

Ten factors are weighed in the forecasting of avalanche hazards: (1) Old snow depth; (2) old snow surface; (3) new snow depth; (4) new snow type; (5) new snow weight; (6) rate of accumulation; (7) wind force; (8) wind direction; (9) temperature developments, and (10) snow settlement.

Of this list, new snow depth, rate of accumulation and wind direction are the most important factors in "triggering" an avalanche. A snow ranger, however, must take all factors into consideration and make a decision based upon field tests, observation and experience. He can't shut down an area just because there is a little snow moving, nor can he afford to take chances with public safety.



Swiss avalanche expert shows ranger how to test the snow's resistance to penetration by a ram instrument. This is an important factor in avalanche prediction

Below, two members of the National Ski Patrol at Mt. Hood use a toboggan to transport this injured skier





Slides can be started "on order" by snow rangers who ski swiftly to the center and then cut back to safety

Avalanche forecasting is a continuous process. During a storm, a snow ranger must keep a mental "box score" of all the factors involved and do a considerable amount of field testing. One who knows his business will not be caught by surprise. He can never forget, however, that he must establish a two-hour "safety margin" before the growing hazard becomes a possible man-killer. It takes about that long to shut down the lifts and clear skiers off the slopes.

In a well-chosen, properly planned winter sports area, the avalanche hazards can be controlled by closing off dangerous slopes, trails and highways until the dan-

ger no longer exists or by triggering avalanches at times chosen by man rather than by the fickle gods of the mountains.

An experienced ski mountaineer can trigger a slope by skiing out on it and zipping back to safety. The Swiss, for many years, have used explosives. Comprehensive experiments along this line have been tried at Alta and elsewhere in the West. One of the best explosives for this type of work is tetrytol, developed in World War II, which is affected neither by cold nor dampness. In Colorado, the 168th Field Artillery Battalion has assisted in the research by firing 105-mm. howitzers into the eight-foot snowdrifts of Hoop Creek Basin.

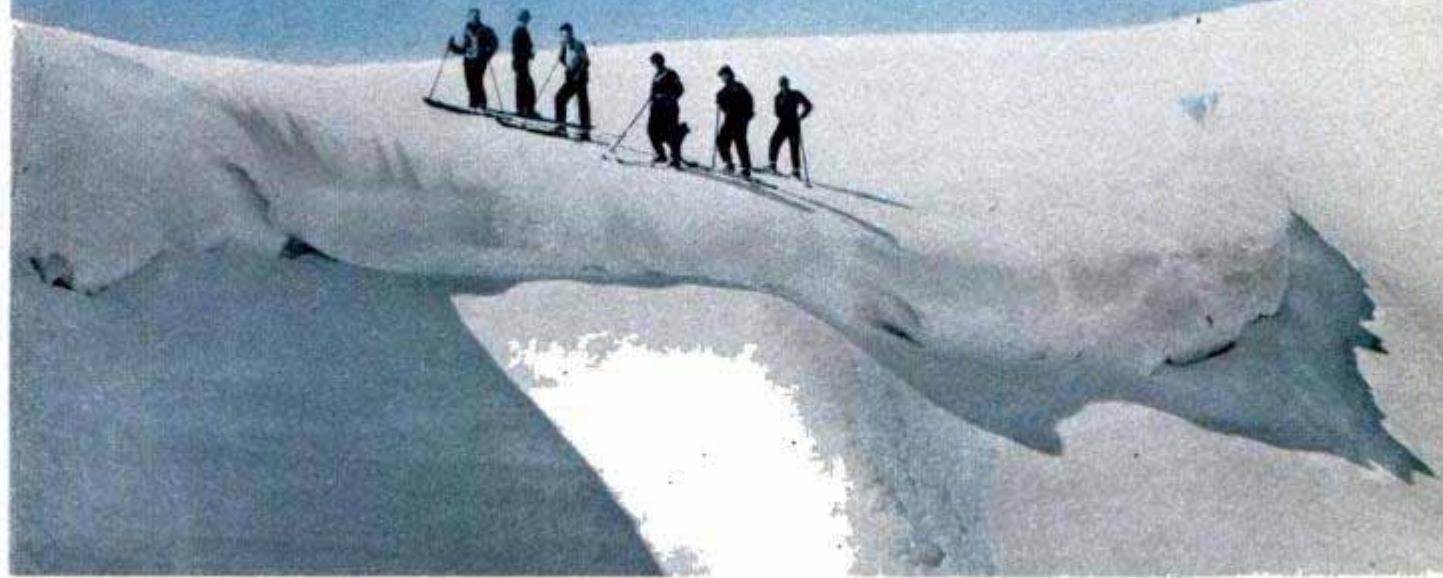
The Forest Service recognizes four types of avalanches:

(1) **Dry-snow avalanches**—composed of loose, newly fallen snow. Where a long, wide slide path exists, this type of slide is highly dangerous. It is sometimes accompanied by a destructive air blast—the slide traveling above as well as on the ground. Danger to the skier lies as much in suffocation from "snow dust" as in physical violence.

(2) **Wet-snow avalanches**—slides of this

Loudspeakers outside ranger's cabin are used to broadcast slide warnings





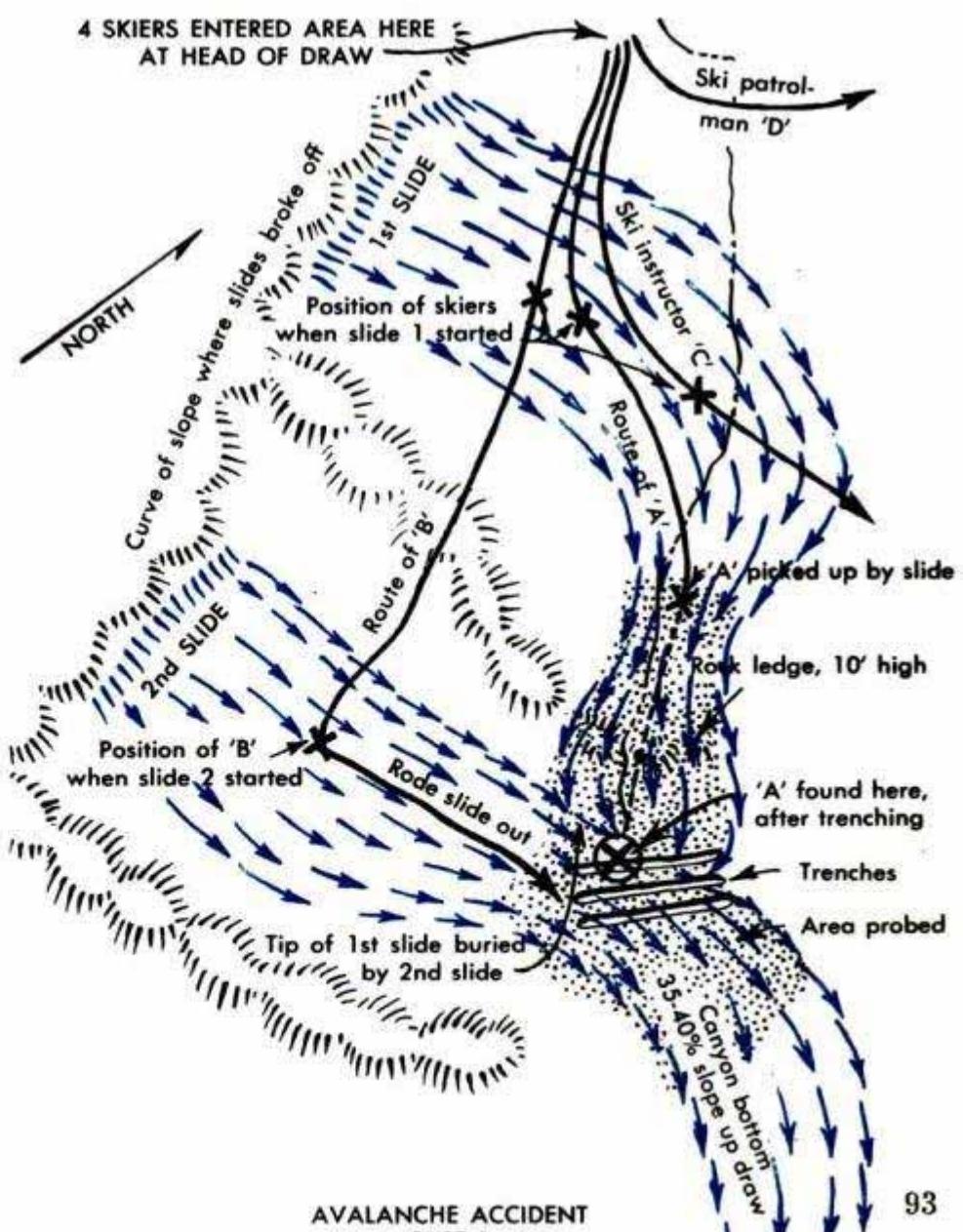
Only experienced skiers under supervision of an instructor or Forest Ranger should investigate snow ledges like this one. Below, diagram illustrates avalanche described in text which resulted in death for one skier.

type are heavier and comparatively slower moving. A skier can generally get out of their way. Their greatest threat is to buildings and stationary objects.

(3) Slab avalanches —these are the most dangerous of all. Snow slab or wind slab has a characteristic dull, chalky, nonreflecting surface, but is generally concealed under fallen snow. Release of a slab avalanche is sudden, violent and extensive. The whole slope starts moving at once. A skier caught in a slab avalanche is knocked off his feet and pounded by grinding, rough-edged blocks. The outcome is purely a matter of luck—usually bad.

(4) Combination avalanches —any one of the three types described above can and often does occur in combination with any or all of the others.

(Continued to page 258)

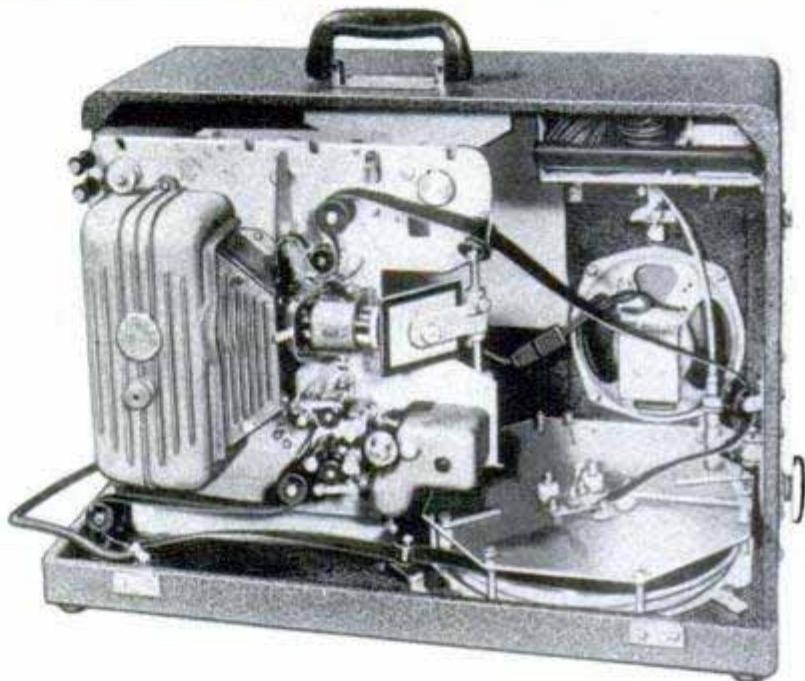




No operator is needed with the suitcase projector shown in use above. Continuous film rewinds itself as it is shown. Right, an inside view showing the film magazine

Suitcase Projector

Weighing only 40 pounds, a suitcase projector provides everything necessary for showing a movie, either silent or sound. Projector, screen, film magazine, amplifier and speaker are compactly arranged inside the carrying case. When in use, the screen is pulled forward and the picture projected on it from the rear. No operator is necessary as the film runs continuously once the machine is started, the magazine rewinding the film as it is shown.



Complete Photo Kit For Beginners

Complete in one package, a beginner's photographic kit provides the young hobbyist with all the equipment necessary to do everything from taking the picture to enlarging the negative. The camera furnished with the kit has a fixed-focus lens and a shutter speed of $\frac{1}{125}$ second to stop action. Masks are provided with the enlarger. Developing trays, a roll-film tank, graduate, safelight bulb, clips, chemicals and an instruction book are also furnished.

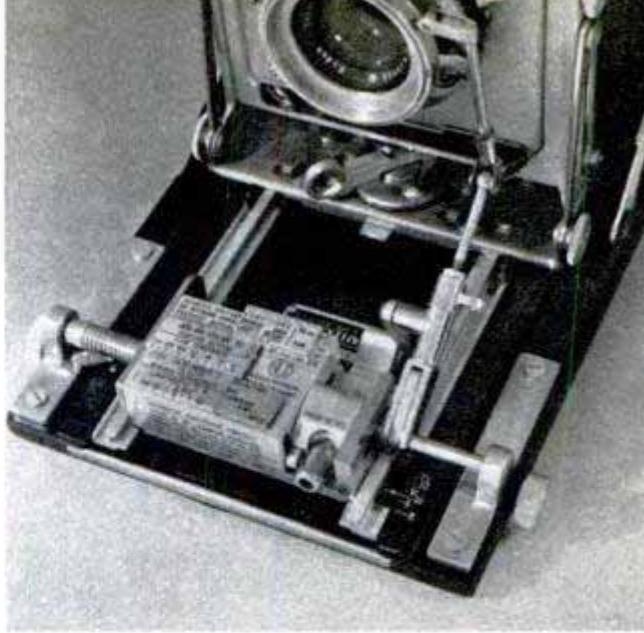


Flash Gun Is Tested Without Taking Apart

Photographers who use midget flash bulbs can test the circuit without removing the reflector assembly by means of a testing unit with a bayonet base. The unit is simply pressed into the socket like a flash bulb. It is especially convenient when testing several extension flashes because it eliminates removing the reflectors, a time-consuming but necessary chore when the conventional screw-type test unit is used.

between-the-Lens Shutter Is 1/800 Second Exposure

Exposures as brief as $\frac{1}{800}$ second are made by a between-the-lens shutter that opens and closes in a manner completely different from previous models. Instead of opening in and out with a reciprocating motion, as conventional shutter blades do, the blades of the new shutter pivot and rotate through a partial circle to open and close in one continuous movement, eliminating the slight pause present in the reciprocating type when the movement changes from outward to inward. Featured on the Kodak Tourist, the shutter is said to be the fastest of its type in the world.

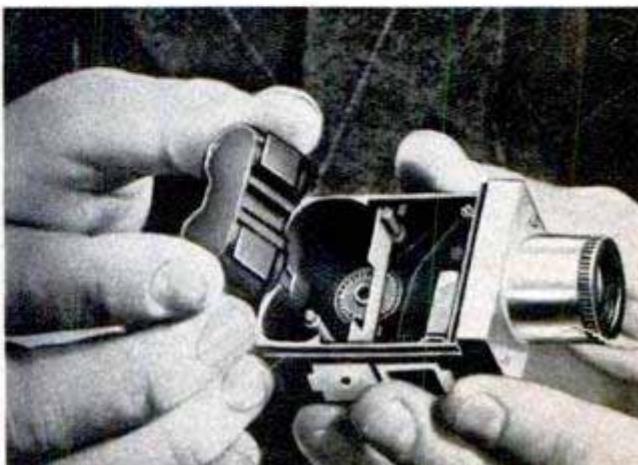


Automatic Diaphragm Control For Photoflash Photographers

Photoflash photographers don't have to bother about diaphragm settings when they have an exposure control coupled to their camera. The control device, designed for use on press cameras, automatically adjusts the diaphragm as the camera is focused. Several scales on the control are preset to match prevailing conditions. These include film speed, shutter speed, flash bulb and reflector types and the conditions of the surroundings. Once these have been set into the control, the photographer merely focuses and shoots, the diaphragm aperture being set by a mechanical linkage. The control does not interfere with normal operation of the camera.

Double Exposures Are Impossible With Magazine-Loaded Camera

Just about foolproof in operation, a new miniature camera has a film transport that winds the film as the shutter is cocked for the next shot, thus preventing double exposures. The 14-exposure film magazine used in the camera requires no threading. You just drop it in the camera, replace the side plate and wind the film. The combination shutter-cocking and film-winding process enables the photographer to take 14 pictures in less than 30 seconds.



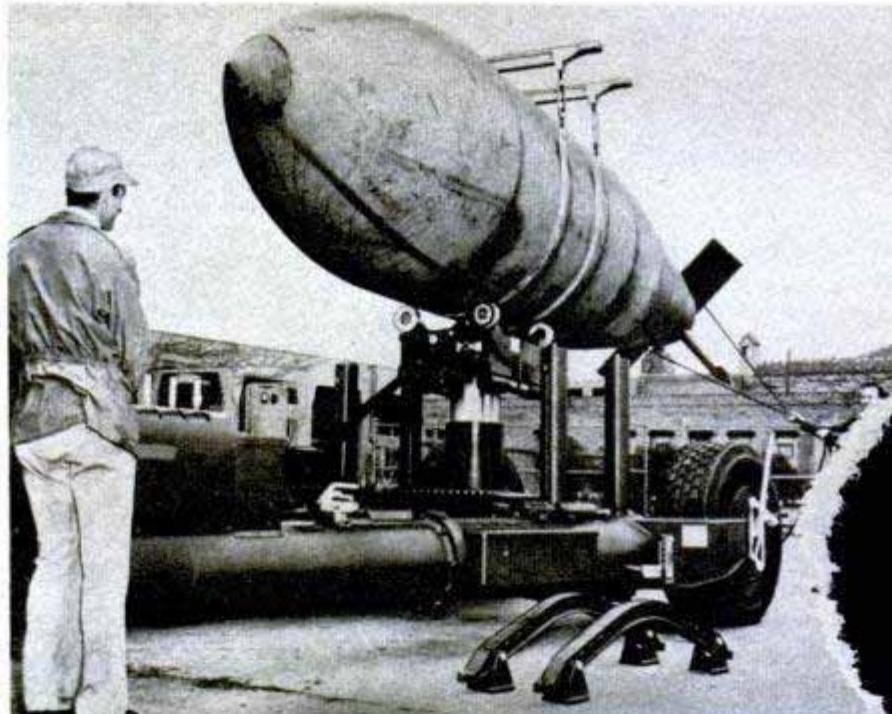


Wet or Dry Dust Spread By Sprayer

Power sprayers can be used for wet or dry dusting when a hopper attachment is added. Developed by the Aero-Mist Sprayer Company for use with their sprayers, the attachment does not interfere with normal use of the sprayer and is easily attached or detached. The hopper holds two cubic feet of dust and has a positive feed control that regulates flow from 2 to 10 pounds a minute.

Elevator on Wheels Lifts Bomb to Plane

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Hens with white lobes lay white eggs, those with brown lobes lay brown eggs.



Copyright by Brown & Bigelow

CALENDARS WITH WINGS

By Clifford B. Hicks

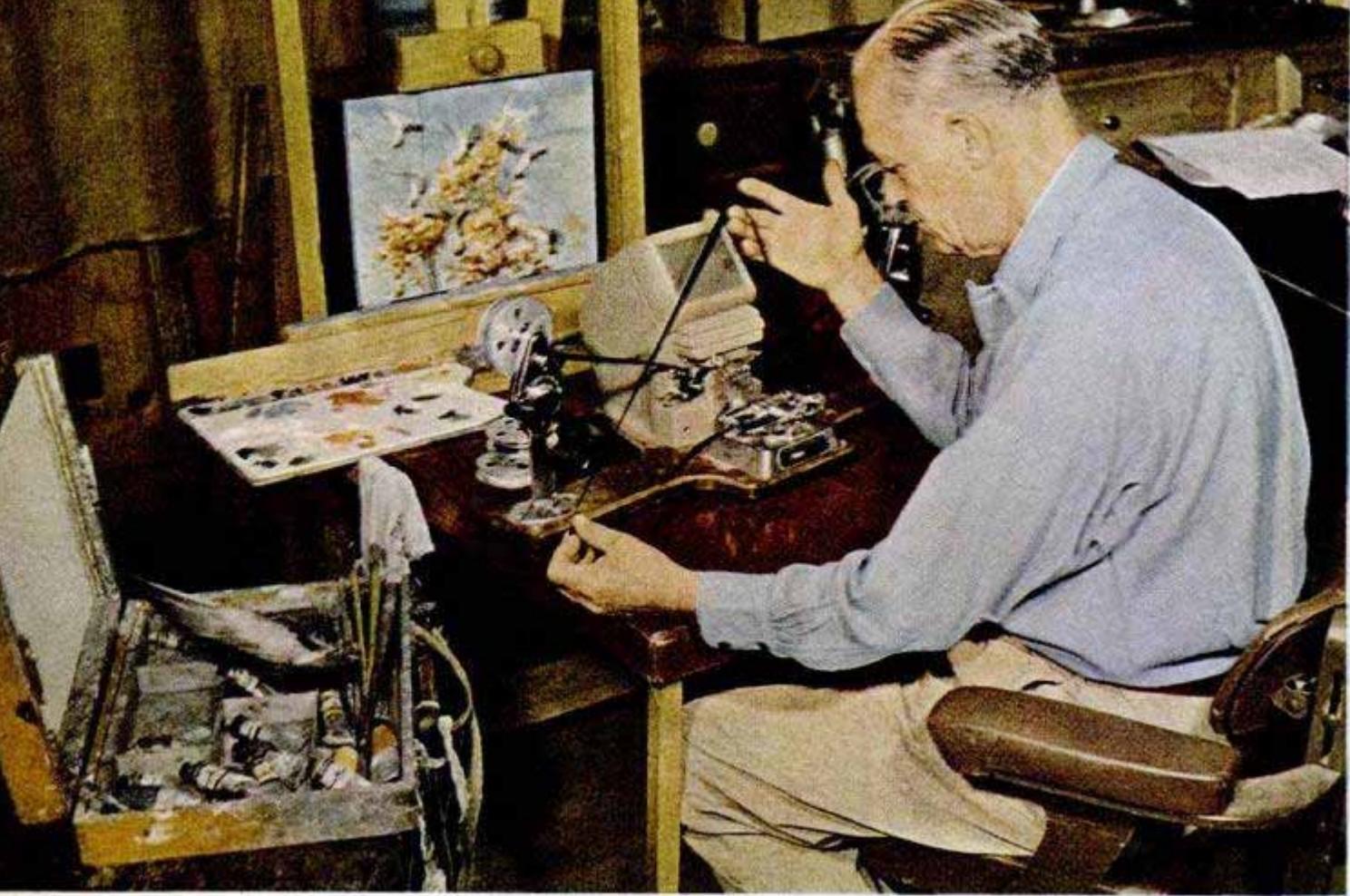
ANY SPORTSMAN who has squatted patiently in a duck blind, waiting for that first flight of mallards to shower down from the early morning skies will put his stamp of approval on the paintings of Richard E. Bishop.

No armchair artist, Dick Bishop paints game birds as you see them over the barrel of a gun. His work somehow rekindles in your mind some half-forgotten incident of bygone hunting days—the wary old pintail that planed down just after you'd bagged your limit or the flock of greenheads that swooped in from nowhere to land not 20 feet from your blind.

Bishop is considered by sportsmen, naturalists and artists alike to be one of America's foremost painters of wild fowl. Millions of people throughout the world see his work on the Bishop calendars each year.

Artist's dramatic painting at top is printed on the annual Bishop calendar by the high-speed press at right. Many people have a collection of calendars





After Bishop has made a preliminary sketch, he runs through film file to find a similar movie sequence. Snipping out about three feet of the film, he runs it through a projector time after time to study the birds' action

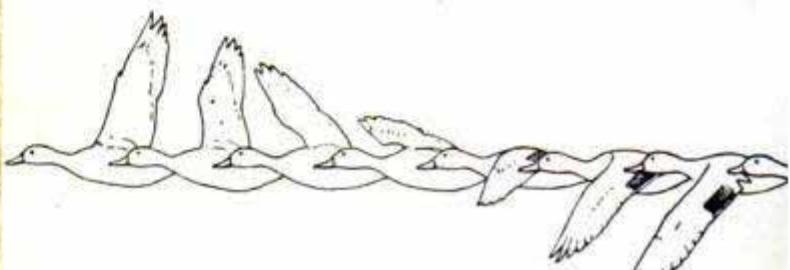
The artist is able to impart a flawless realism to his work because he has spent a lifetime studying the flight of game birds. He has taken thousands of feet of slow-motion pictures showing wild fowl in all stages of flight. By studying these films, Bishop has discovered how a bird flies, how it lands and how it keeps its balance. Bishop's friends say they wouldn't be at all

surprised to see the artist himself hovering high in the air over his mountain-top studio some day.

Discharged from the Army back in 1919, Bishop returned to his old job as engineer and salesman for a rolling mill. He returned, too, to the lakes and marshes, to the woodcock cover which he had tramped and hunted all his life. One day engineer Bishop picked up an old sheet of copper and decided to try etching on it one of the game birds he loves. That started his career as artist Bishop. He had never taken any art training, but somehow, with a phonograph needle, wax and acid, he transferred to the copper the feeling of motion and majesty he saw over the barrel of his gun. A print of this etching won a prize in a Philadelphia print exhibit.

In an effort to broaden his field, he began studying art at night school. Soon he was painting flights of Canadian geese against

Artist is an authority on bird wings. His collection includes all types from an eagle to a humming bird. Such study produces fine realism in his paintings





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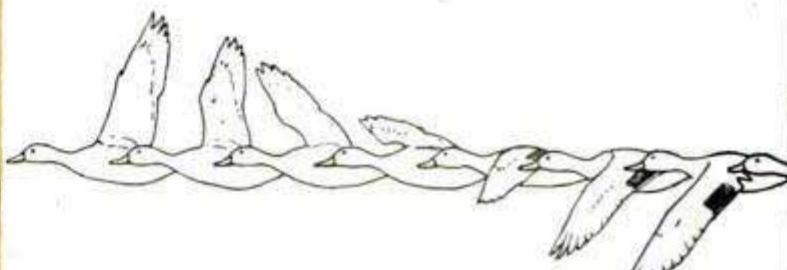
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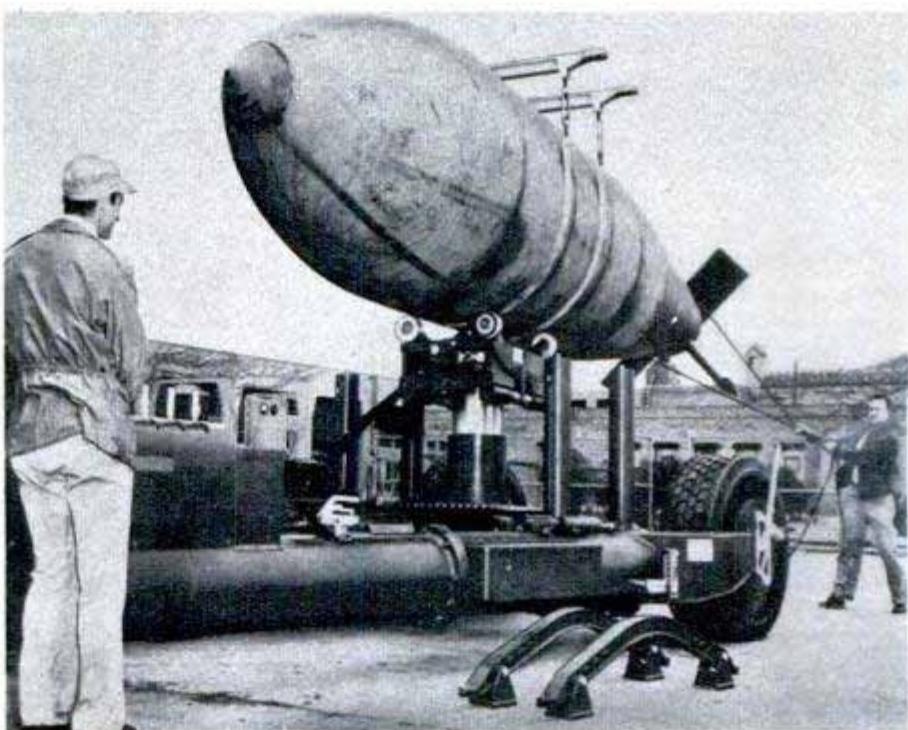


Wet or Dry Dust Spread By Sprayer

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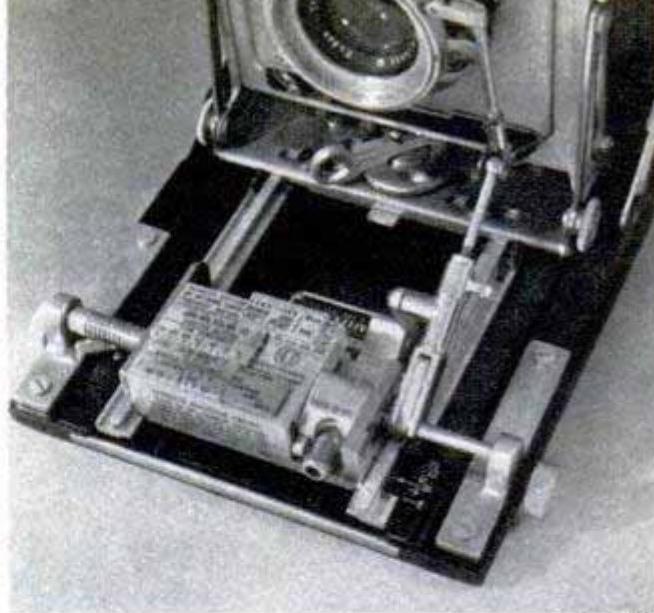


Flash Gun Is Tested Without Taking Apart

Photographers who use midget flash bulbs can test the circuit without removing the reflector assembly by means of a testing unit with a bayonet base. The unit is simply pressed into the socket like a flash bulb. It is especially convenient when testing several extension flashes because it eliminates removing the reflectors, a time-consuming but necessary chore when the conventional screw-type test unit is used.

Between-the-Lens Shutter Has 1/800 Second Exposure

Exposures as brief as $\frac{1}{800}$ second are made by a between-the-lens shutter that opens and closes in a manner completely different from previous models. Instead of moving in and out with a reciprocating motion, as conventional shutter blades do, the blades of the new shutter pivot and rotate through a partial circle to open and close in one continuous movement, eliminating the slight pause present in the reciprocating type when the movement changes from outward to inward. Featured on the Kodak Tourist, the shutter is said to be the fastest of its type in the world.

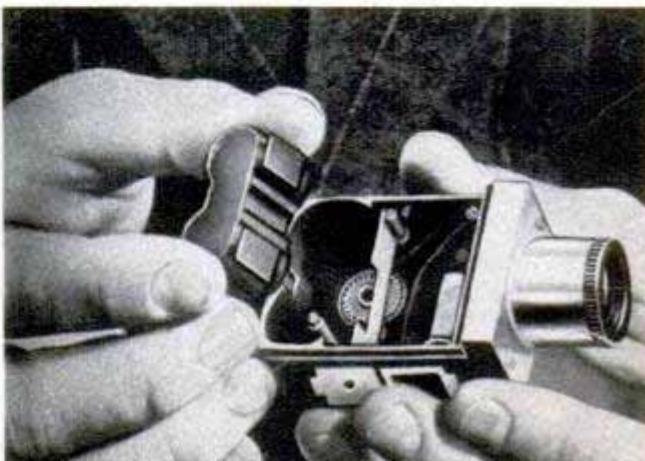


Automatic Diaphragm Control For Photoflash Photographers

Photoflash photographers don't have to bother about diaphragm settings when they have an exposure control coupled to their camera. The control device, designed for use on press cameras, automatically adjusts the diaphragm as the camera is focused. Several scales on the control are preset to match prevailing conditions. These include film speed, shutter speed, flash bulb and reflector types and the conditions of the surroundings. Once these have been set into the control, the photographer merely focuses and shoots, the diaphragm aperture being set by a mechanical linkage. The control does not interfere with normal operation of the camera.

Double Exposures Are Impossible With Magazine-Loaded Camera

Just about foolproof in operation, a new miniature camera has a film transport that winds the film as the shutter is cocked for the next shot, thus preventing double exposures. The 14-exposure film magazine used in the camera requires no threading. You just drop it in the camera, replace the side plate and wind the film. The combination shutter-cocking and film-winding process enables the photographer to take 14 pictures in less than 30 seconds.



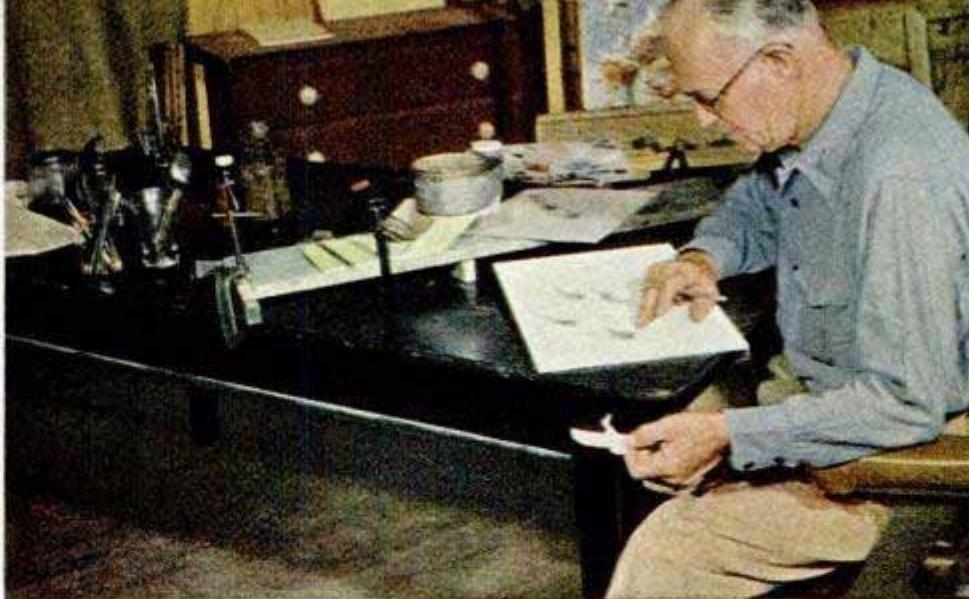
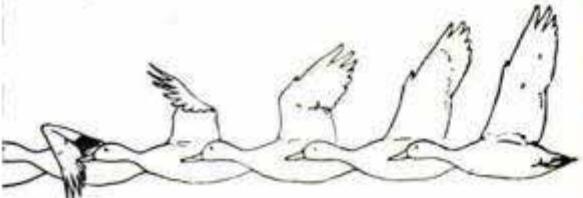


the dark skies, mallards and pintails rocking and sideslipping in for a landing. About this time, too, he began taking black-and-white movies at 128 frames per second and analyzing the film to find out what happens to each feather during a wingbeat.

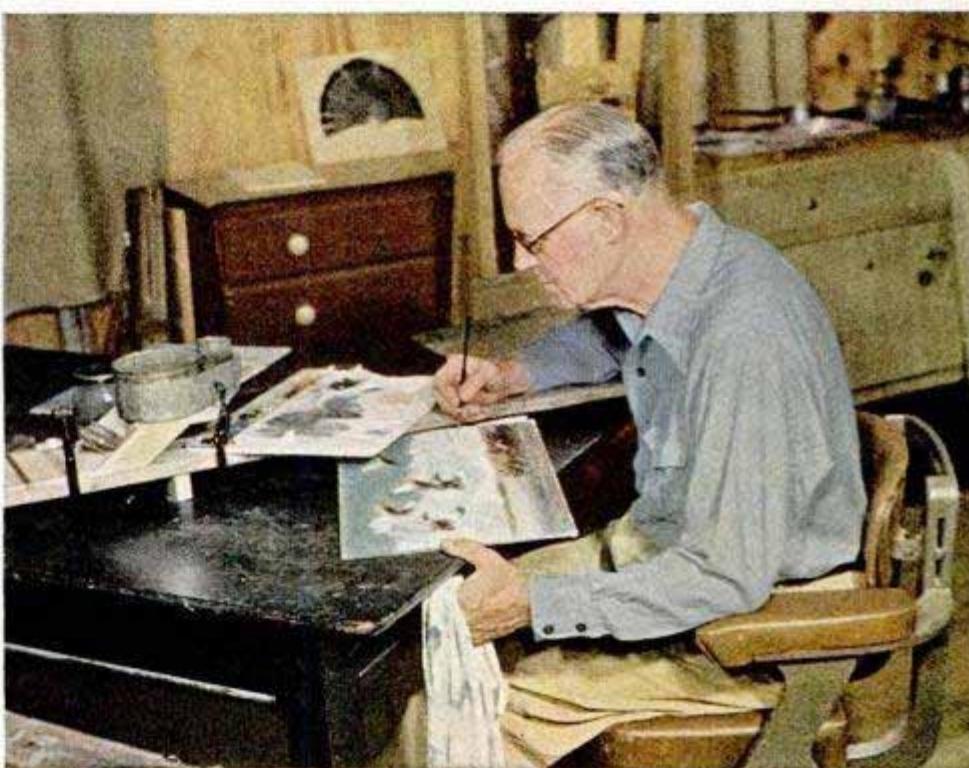
It wasn't long until the tail began wagging the dog. In 1933, at the height of the depression, he abruptly dropped his sales and engineering work and became a full-time artist. It was a wise decision, both for Bishop and for sportsmen.

Bishop's calendars, published by Brown & Bigelow of St. Paul, have become the chief means of broadcasting the beauty of his paintings. They adorn the walls of 250 different types of business establishments from coal yards to night clubs. Each year six of the artist's paintings are reproduced on the Bishop calendar, treasured by sportsmen everywhere.

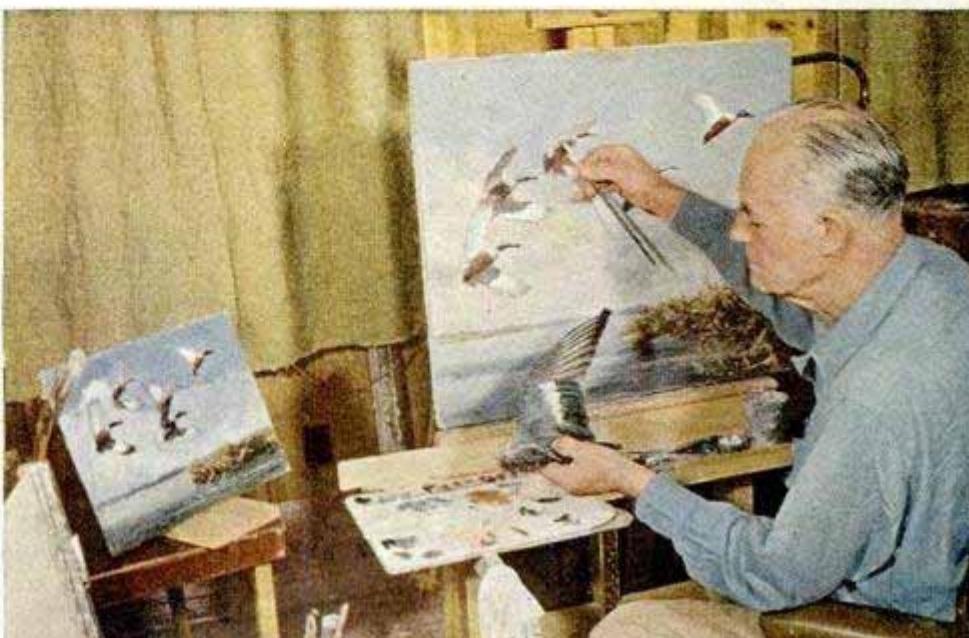
The artist first makes small pencil sketches to work out the approximate scenes he wishes to depict. Then, working very fast, he paints from 8 to 12 of the scenes in oil. He says he "roughs them in" but most sportsmen would be happy to frame and hang these "roughs."

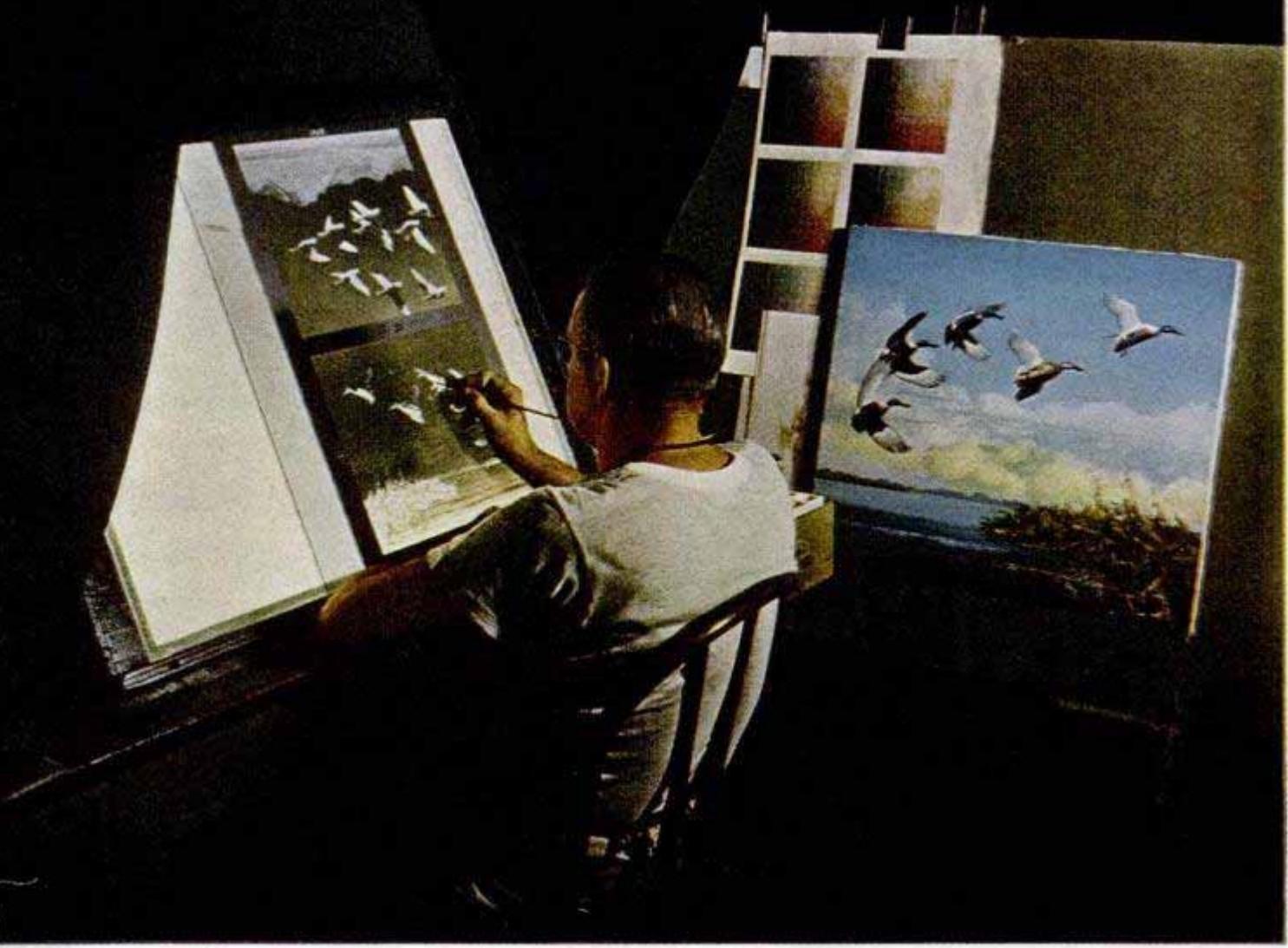


First step in painting is to lay out pattern of birds with cutouts

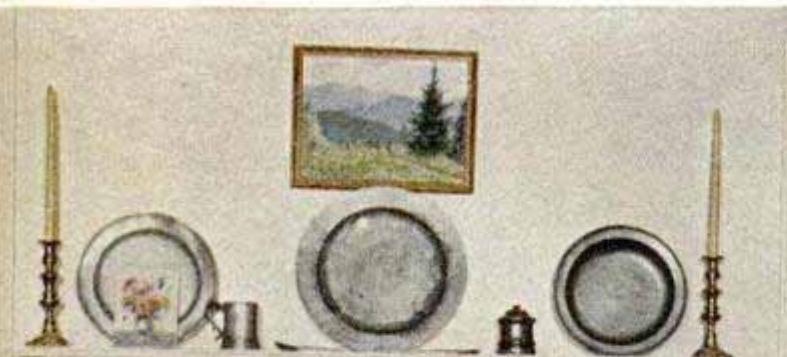


Next, Bishop fashions what he calls a "rough" to serve as a guide. Actually, most sportsmen would consider it beautiful enough to hang. Below, to get detail for final painting he studies wings of a shoveler





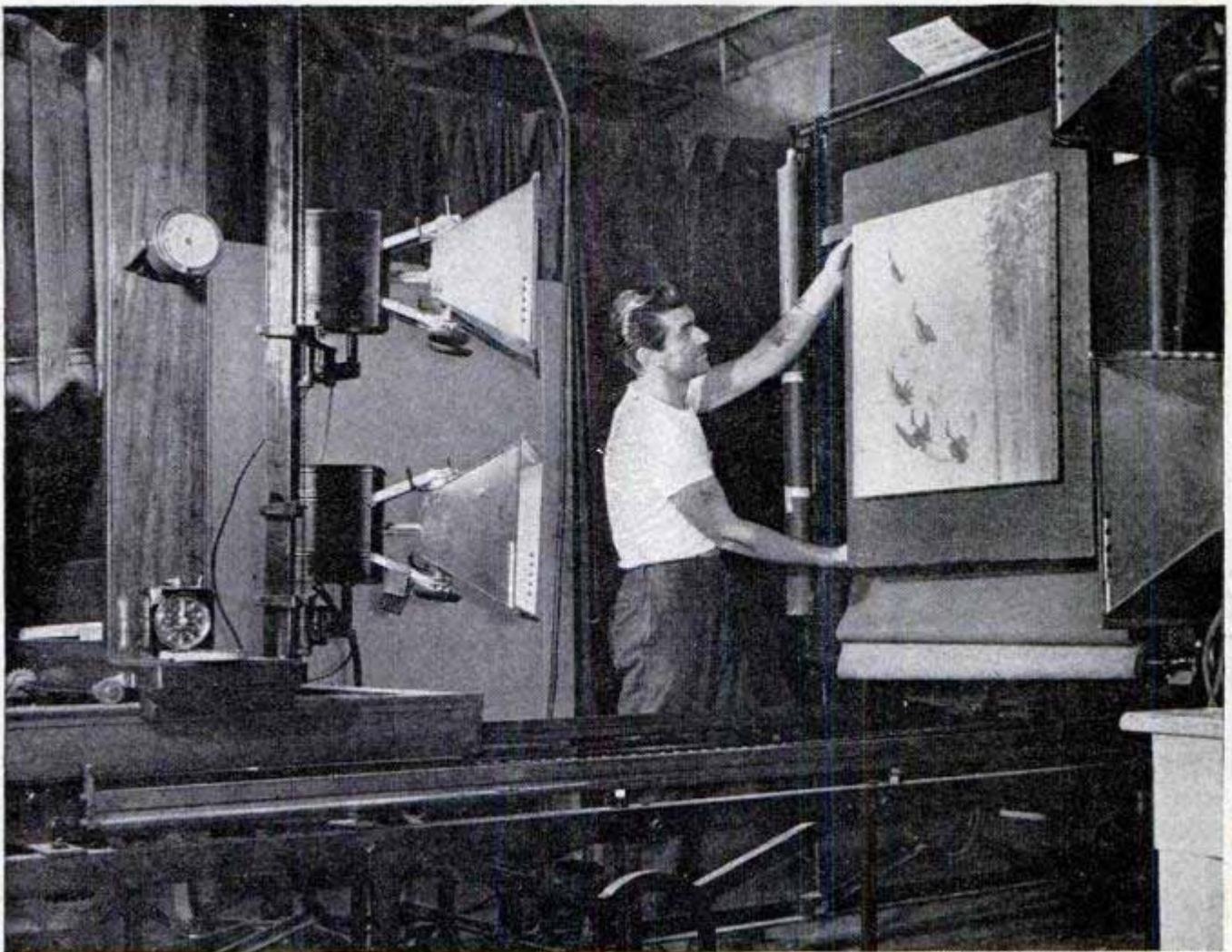
In printing painting, it is photographed into color-separation negatives. Here artist retouches negatives. He compares painting and color chart with them. Below, Bishop's fireplace tiles each show different bird



These preliminary paintings, each showing a different type of bird, are sent to Brown & Bigelow, where a committee chooses six of them for final execution. Then with a deft brush and the knowledge that has come from many years of wild-fowling and study, Bishop covers the canvas with birds so real that you can hear the rush of their pinions and the slap of their feet as they plane in for a landing.

It is during this phase of his work that Bishop uses his extraordinary motion pictures. The artist has traveled throughout the North American continent, Great Britain and the Pacific islands to photograph wild fowl in their natural surroundings, an undertaking that requires much more skill than firing a shotgun at a rising redleg. This month he is leaving on a trip to Africa to photograph the birds of that continent.

Bishop's 16-mm. camera originally was designed to analyze machinery or sports in



Credit—Brown & Bigelow photos

slow motion. He uses a six-inch lens with an f:2.7 aperture. Years ago he told a friend—a mechanical and mathematical genius—what he wanted in the way of a range finder. The friend came back with a superb attachment that will focus from infinity to 10 feet in an instant by the movement of a trigger on the camera gun-stock. The movies are taken on color film at $\frac{1}{250}$ second, with 128 exposures per second. When they are projected, the birds move at only one eighth their actual speed. And the lens brings them fluttering up to your lap.

In the field, Bishop virtually thinks like a duck. He anticipates their movements and knows where they are apt to fly next. But the focal depth of his lens is only about 18 inches, so a large percentage of his motion pictures are out of focus. He edits his films, throwing out an estimated 80 percent of the footage. He has exposed at least eight miles of movie film in 25 years.

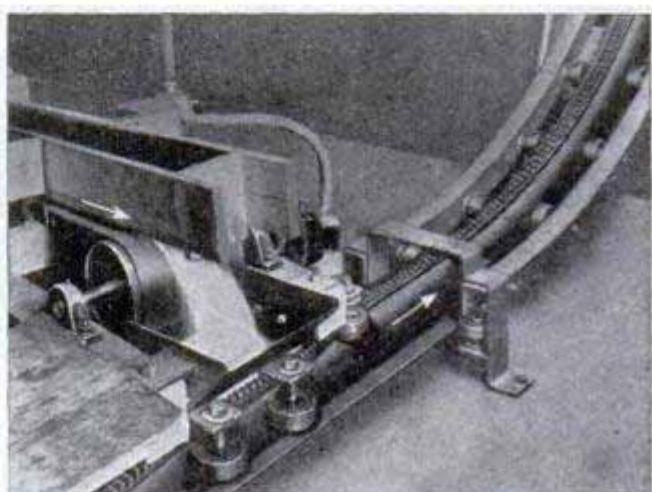
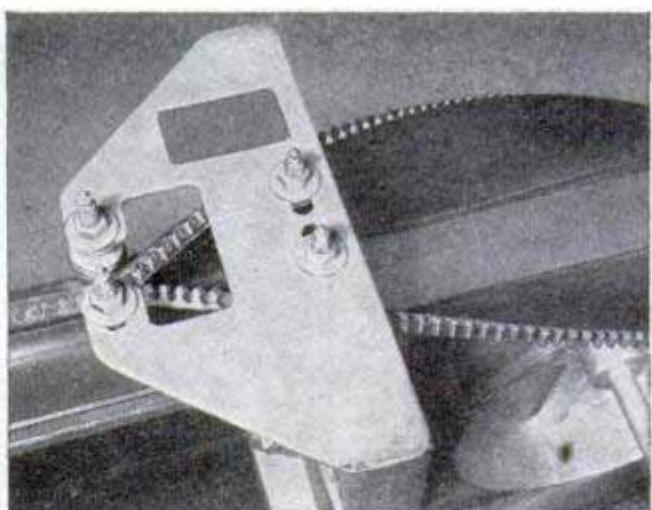
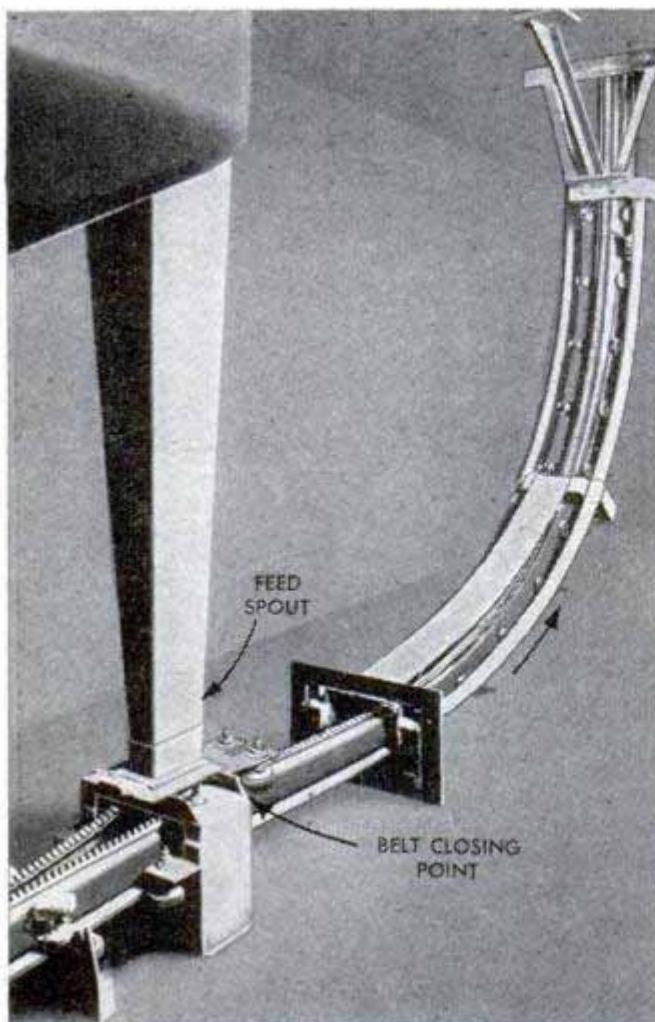
When an approved calendar sketch is returned to Bishop, he runs through his film file and finds a flight of birds which duplicates the action he wishes to depict in the final painting. He then snips out about three feet of the chosen sequence, splices the ends together and mounts the film in his projector. When he turns on the

This camera separates the colors in the painting, taking one negative for each of printing-ink colors

Complete six-sheet calendar is assembled in mounting machine, which binds it with strip of tin across top



(Continued to page 238)



Left, materials drop into open top of belt just before zipper teeth are closed. Top, right, ball-bearing rollers unlock teeth to discharge load. Lower, right, flat conveyor belt can be set up to feed zipper belt

"Zipper" Conveyor Belt

Rubber teeth on a new conveyor belt mesh like a zipper, sealing the belt into a tube that can travel up, down or around curves. The belt is designed to handle breakable materials gently and without contamination. It is being used to move

seed corn, almonds, fragile ceramic pellets and dehydrated potatoes. The open belt approaches a feed spout where the material is dropped inside. Rollers then lock the teeth together and the belt moves along a track. At the unloading point, rollers force the teeth apart and the belt is drawn over a pulley to discharge the load.

Automatic Transmission for Ford and Mercury

Clutch pedals will be missing from Fords and Mercurys equipped with a new automatic transmission which is expected to be in production early next summer. This transmission, developed by Borg-Warner Corp., in cooperation with Ford, will feature gasoline economy. Officials of the Ford Company report that in tests the new transmission gives better gasoline mileage than cars fitted with the old conventional transmissions. The shift embodies a hydraulic torque converter and an automatically shifted three-speed planetary gearbox. The latter is so arranged that the engine transmits power in all gear ratios. Automatic changeover from intermediate to top gear is effected anywhere from 15 to 60 miles an hour. The changeover depends on the amount of throttle used. The trans-

mission selector on the steering column has four positions for driving conditions and a fifth position for the parking brake. Neutral is in the center with driving range and low-gear positions to the right; parking and reverse are to the left. As in other automatic selectors, the shift to low gear or reverse is done manually; all other driving is done with the selector in driving-range position and the shifting is fully automatic. According to reports, the optional transmission will be priced at "not over \$150."

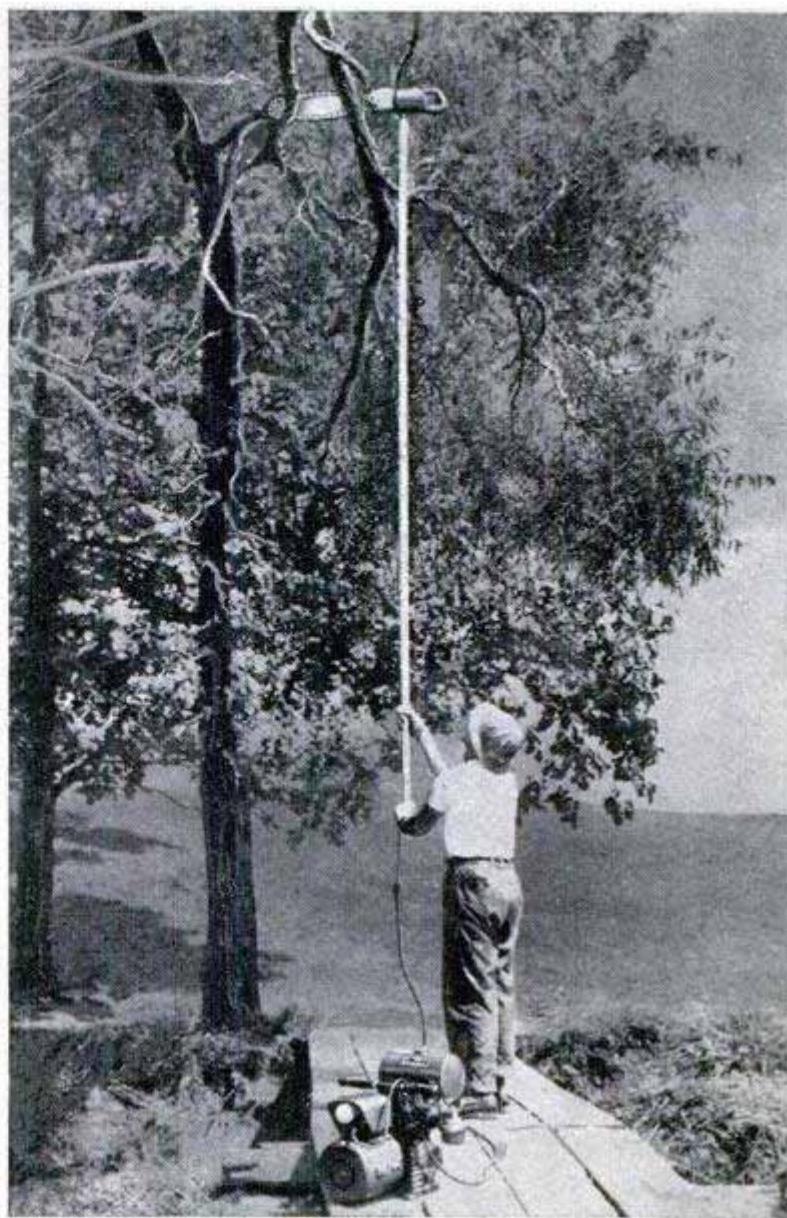
Creaking joints are not a sign of old age, says an Oregon doctor, whose experiments show that such factors as temperature, humidity and even thunderstorms affect the frequency with which the bones in his fingers cracked when twisted.

Lightweight Chain Saw →

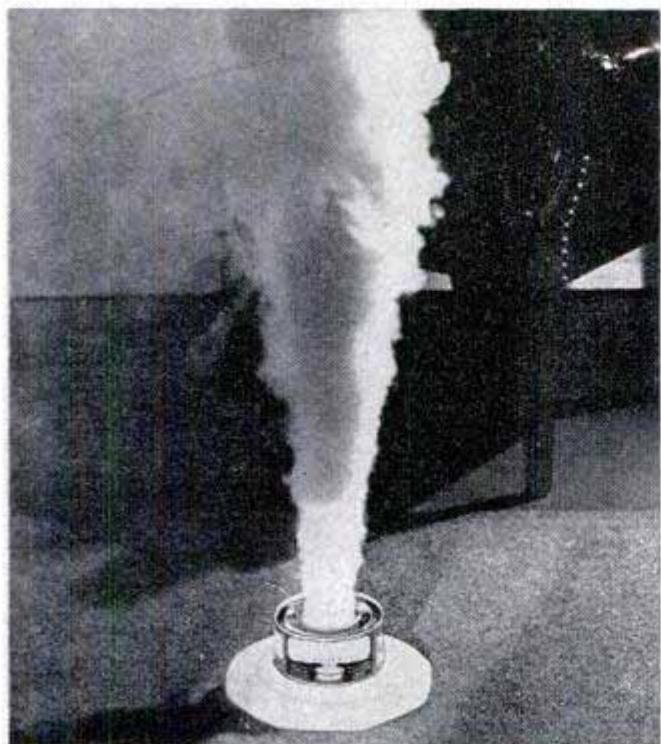
Weighing only 11 pounds, an electric chain saw can be equipped with an extension pole so that you can cut 12-inch branches high in a tree while standing safely on the ground. By taking two cuts, you can fell, buck and limb trees up to 24 inches in diameter. Its lightness makes possible one-hand operation from a ladder or scaffolding. Operating on 115 volts, a.c. or d.c., the saw plugs into any standard household outlet or, for field work, it can be powered by a portable generator.

Rocket "Diary"

Guided missiles now carry a magnetic metal tape "diary" in an armored cylinder when they penetrate the atmosphere miles above the earth. Data on air pressure, speed, temperature and many other factors are recorded on the tape which is 150 feet long and six inches wide. The recorded section is fed into a cylinder, armored to withstand the shock of crashing to earth when the missile's flight ends. After recovery, the tape is played back through a transcriber and the information plotted on charts. Developed by the Armour Research Foundation of the Illinois Institute of Technology, the new method may replace the automatic radio signals now used. The present system involving radio signals requires elaborate



air and ground equipment, and difficulties are often encountered in both transmission and reception.



Automatic Dispenser For DDT Insecticide

Smoke is used as a carrier for DDT in a new indoor insecticide packaged in a can that dispenses the spray automatically. According to the manufacturer, the smoke-borne DDT not only kills flying insects, but it continues to kill bugs for several weeks after the treatment because of the invisible layer of DDT that remains on all exposed surfaces. When a release tab on the can is pulled, the DDT-carrying smoke issues from the can and circulates through the room, getting into hard-to-reach places. The smoke will not soil or tarnish anything and, after airing, the room retains no odor.

Hot was the word for the temperature at Azizia, Libya, North Africa, on Sept. 13, 1922, when the thermometer read 136 degrees, a world's record, according to the U. S. Weather Bureau.



Young lady whispering to Mrs. Santa, who tends to her knitting, shows the relative size of this huge display



SANTA CLAUS LIVES IN

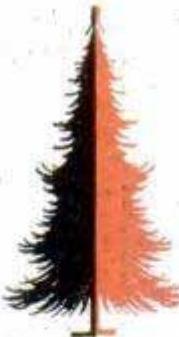
By Richard F. Dempewolff

SANTA CLAUS' workshop is not at the North Pole as you've been led to believe. It's in Pittsburgh.

There, in two big factories covering 150,000 square feet the floors are chock full of startling realistic mechanical creations. Eight-foot Santas sit in monstrous chairs, heaving with deep-bellied laughter. Some roll their twinkling eyes at passers-by, others slap their big thighs in good-humored mirth. Near by Mrs. Santa rocks back and forth knitting a sweater she's been working on for 15 years.

Mechanical gnomes poke their Disneyish faces from every nook, some playing tunes on fiddles, others hammering at forges or working at planing tables. There are reindeer that move and talk, fairies and elves hovering on gossamer wings. There are Santas riding in jiggling jalopies, Santas in sleighs full of toys, Santas being bathed by dwarf attendants. There are rocking Santas, laughing Santas, talking Santas.

But that's not all. Here in this craftsman's



Elysium from time to time you might find complete, full-scale houses under construction, full-size diesel engines, a monstrous electric razor capable of shaving Paul Bunyan, or even Paul Bunyan himself, 23 feet high in sitting position, with eyes that turn and lips that move as he speaks.

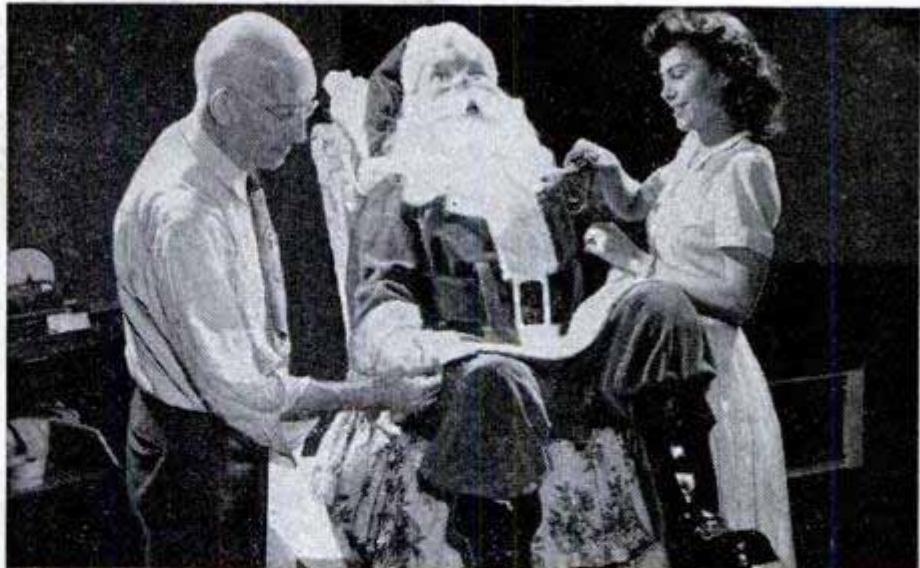
On the other end of the scale are models to delight the most exacting model builder. A table-top model of an entire steel mill, for instance, in which tiny machinery takes the miniature billet, rolls it, drops it in a furnace, stamps it out in forms, lifts them by diminutive crane, runs them through baths and produces one-inch railroad-car wheels. Or perhaps you'd be more fascinated by the pocket-size working model of a four-ton lathe.

Over this dazzling array of craftsmanship hangs an aura of busy excitement. There's a medley of singing saws, whirring motors and the tinkle of music boxes being tested —punctuated by the steady tattoo of hammers. With Christmas coming on, the demand for Santa Clauses is tremendous.

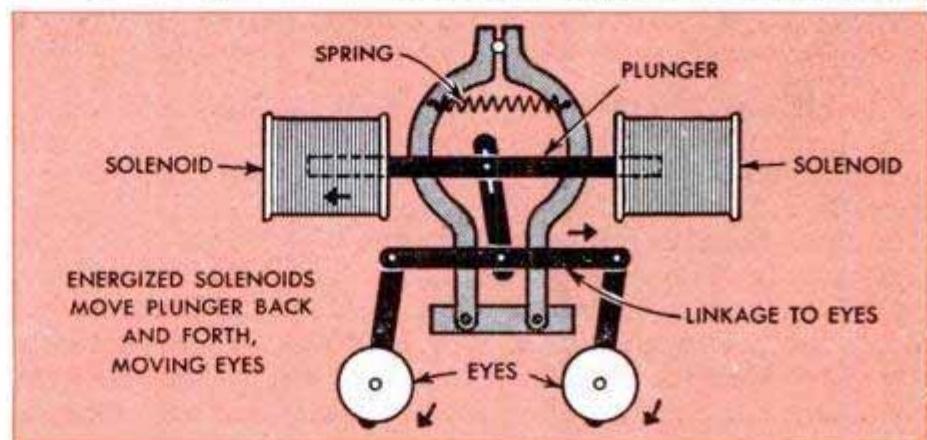
Department stores want mechanical Christmas displays for windows and toy departments. Industry wants models and eye-catching behemoths for conventions and fairs.

So, today, the inventors, artists and master mechanics in Pittsburgh's streamlined version of Santa's North Pole factory—the Gardner Displays Co., which began in 1918 as a little sign-painting shop and has grown into one of the biggest display outfits in the country—are busier than ever satisfying demands.

The St. Nicks and their whimsical entourage of dwarfish folk were introduced to the Gardner line about 10 years ago by Karl Roth. Roth, until his recent death, was a busy, gnomish fellow himself. He gave the mechanical Santas every realistic quirk his fertile mind could conjure. Their



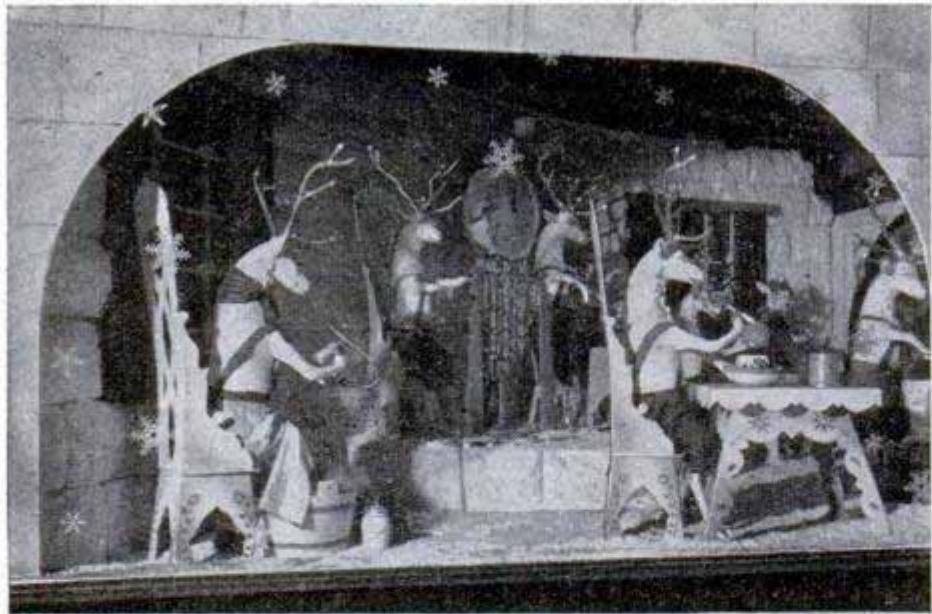
Rocking Santa gets his whiskers curled in preparation for the holidays



Above, solenoids and linkage control eye movements. Below, when these Santas and gnomes are dressed up for Christmas, you won't see the "works" visible here

PITTSBURGH





In this display, the reindeer at left has a cold and sprays his nose with an atomizer. The one at the table helps himself to a big Christmas dinner

bellies shake when they laugh; their shoulders heave; they tap their feet. Today there are 36 big laughing Santas in existence, plus 250 others that perform a variety of stunts. Each is handmade and the biggest ones rent for \$500 a season. At that, there aren't nearly enough to go around. Stores lucky enough to rent them continually get requests from parents to hold them over. One store got so many such requests that it had to keep Santa laughing clear through January.

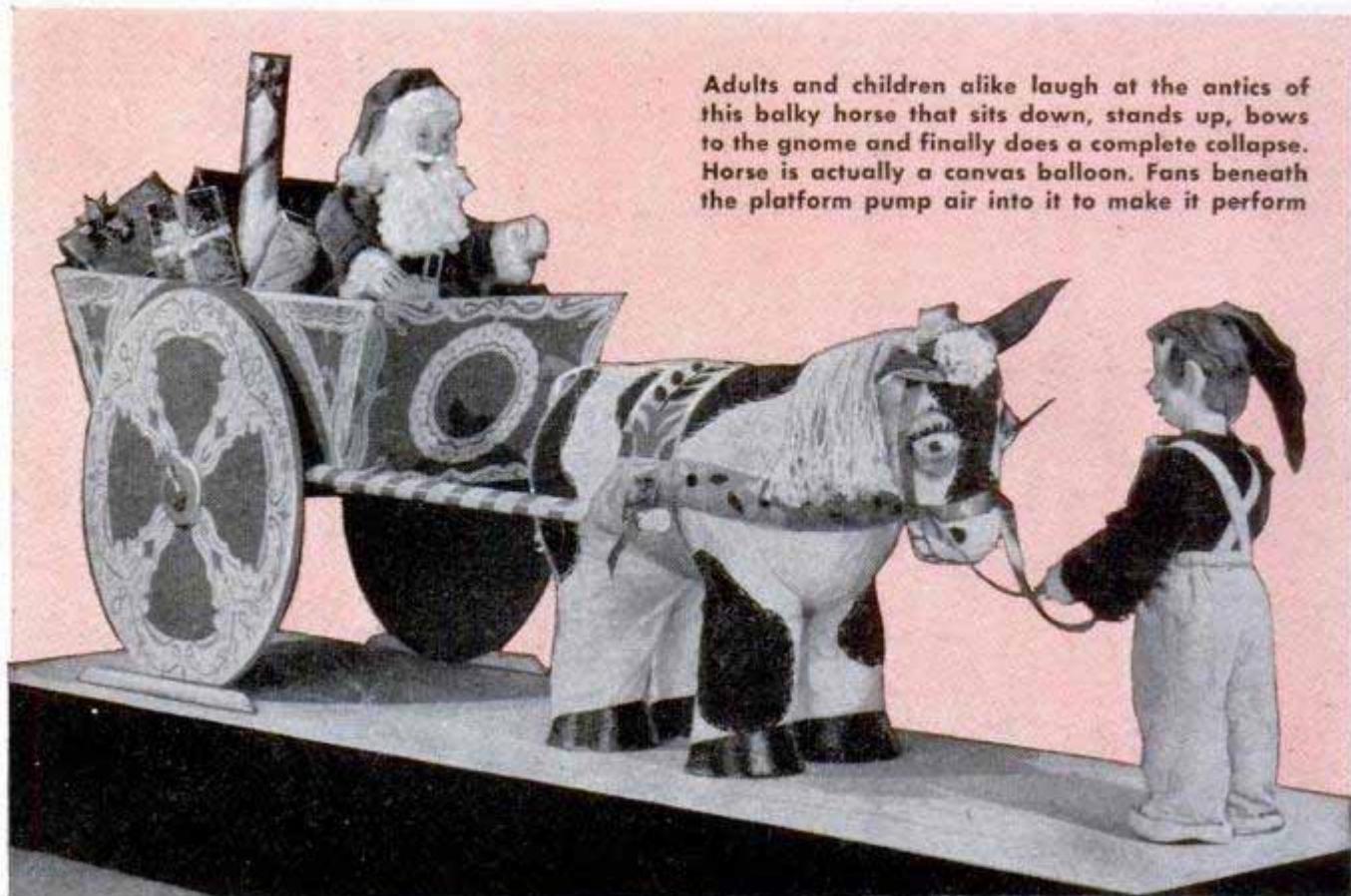
Since the first Santa, Karl Roth's principles have been applied to other kinds of

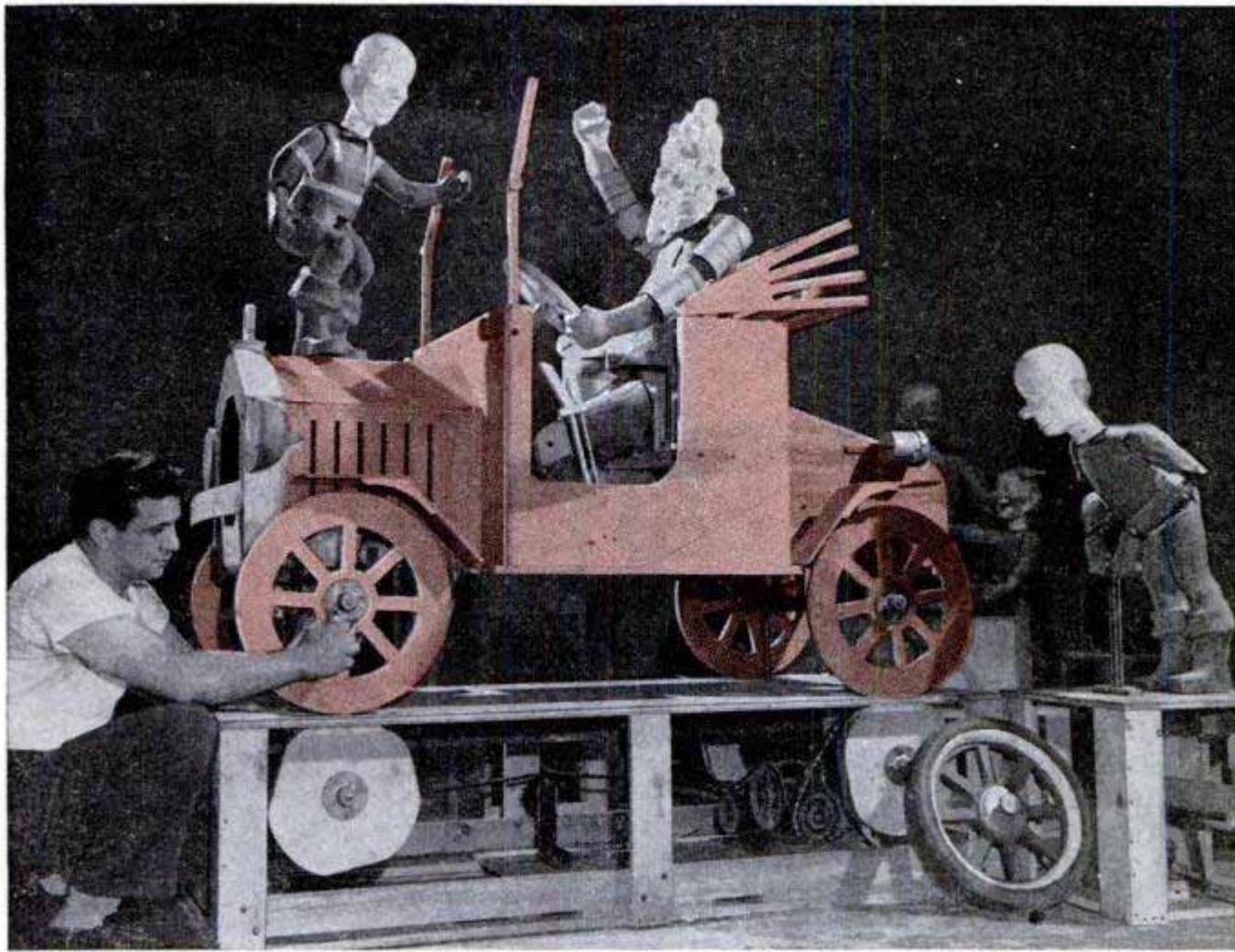
Gardner robots. Reactions are always terrific, for the incredible realism of these creatures is enough to stand your hair on end. Recently, one of the men from the Gardner executive offices was walking through the shops and happened to see a realistic figure being set up for an elaborate display. He felt the fellow's foam-rubber countenance, whereupon the figure raised its hand, opened its mouth and snapped, "Take your hands off me. What d'ya think you're doin', Bub?"

The genius behind the vocal chords of the Santas and other Gardner robots is Bill Hill, an electronics wizard. "All our talking and moving figures have a spinal column," he explains. "This carries the wiring and relays which synchronize the lip action with the voice."

The mouths of Gardner talking dummies don't just bob up and down rhythmically. They go by syllables. The skeleton framework of the head is made in two pieces. The lower jaw, hinged under the skull, is an entirely separate piece that raises or lowers just like a human jaw, held shut by a spring. It is drawn downward by an

Adults and children alike laugh at the antics of this balky horse that sits down, stands up, bows to the gnome and finally does a complete collapse. Horse is actually a canvas balloon. Fans beneath the platform pump air into it to make it perform

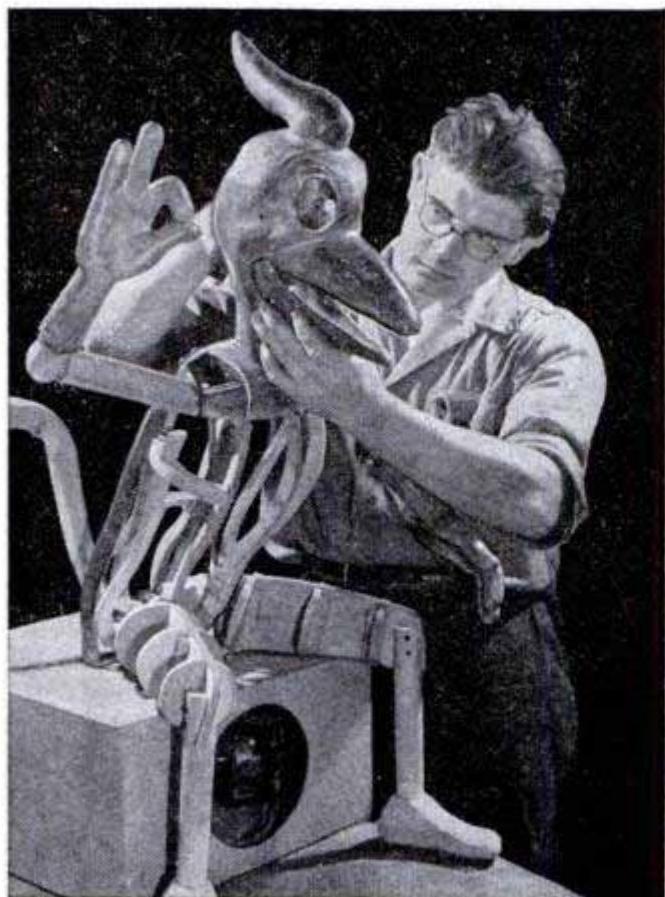




The "Jalopy" is the latest Gardner creation. Santa and gnomes put on an act as it bounces over the "highway"

Not all Gardner displays are for Christmas. This is a "weather bird" that talks, giving weather reports

Working in Santa's workshop, this animated gnome is busy night and day, planing away on a piece of wood





Truly a Paul Bunyan of displays, a 23-foot model of the huge woodsman talks and moves. That's a real girl between his feet

Below, assembling the mighty Bunyan at the Chicago Railroad Fair. It took two men to put the fist of the figure in place



electromagnet which, in turn, is controlled electronically by sound impulse. Somewhere in the figure—usually in the chest—is a loudspeaker, from which the voice is broadcast. Thus, a hidden operator with a mike can answer questions asked by anyone in the audience. Current goes from the operator's mike through an amplifier, which furnishes power to operate the lips. The longer the syllable, the more power. And the more power, the longer the reaction on the electromagnet, which holds the jaw down until the syllable subsides. To heighten the realism, the skeleton framework of the giant's head is covered with foam-rubber skin and features.

Movement of the creatures is controlled either automatically by eccentric cams, or manually by push button. "We make them stand up and sit down," says Hill. "Their eyes roll by electromagnet operating on a hinged crossbar like the eyes of a 'sleeping baby doll'; their hands can move to saw a fiddle, raise in a gesture, hammer pegs, or shake yours—all by simple arrangement of motors, cams, shafts and gears."

A 12-foot "Alice in Dairyland," made especially for the Wisconsin Centennial, stood up from a chair, greeted visitors as they entered, then sat again. At the Chicago Railroad Fair, there was Genial Joe, the nine-foot railroad engineer, who answered questions about railroading all day long.

Gardner craftsmen will tell you that nothing is impossible. Hanging above the desk of Jim Seibel, whose job it is to figure out how to design and build many of the weird requests that come in, is a quote that says: "It's a significant coincidence that the word American ends in 'I Can.'" Seibel believes it, too.

Recently, a client wanted a series of animated dioramas that would be seen one at a time—like a shifting scene. Seibel and Hill went them one better by having the three-dimensional dioramas fade into each other. How? A Chinese mirror, transparent glass when you look through it at one angle, a mirror at another. Half the dioramas were set up on a moving belt on a platform. The others went on a second platform belt in front of,

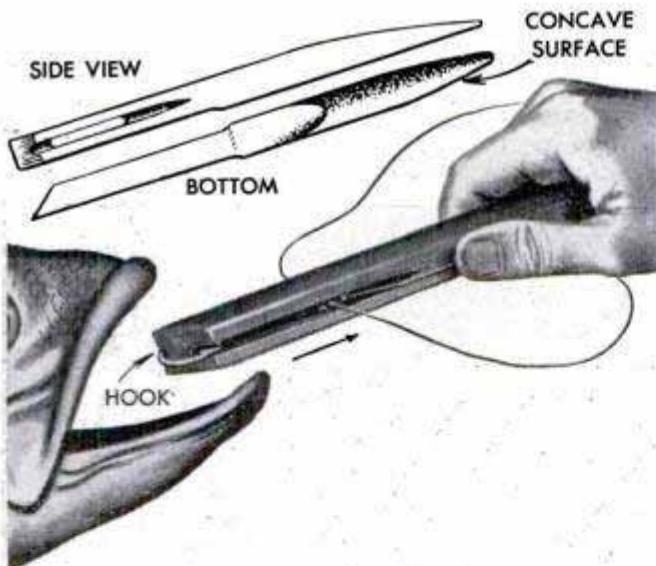
(Continued to page 266)



Helicopter Flies "No Hands"

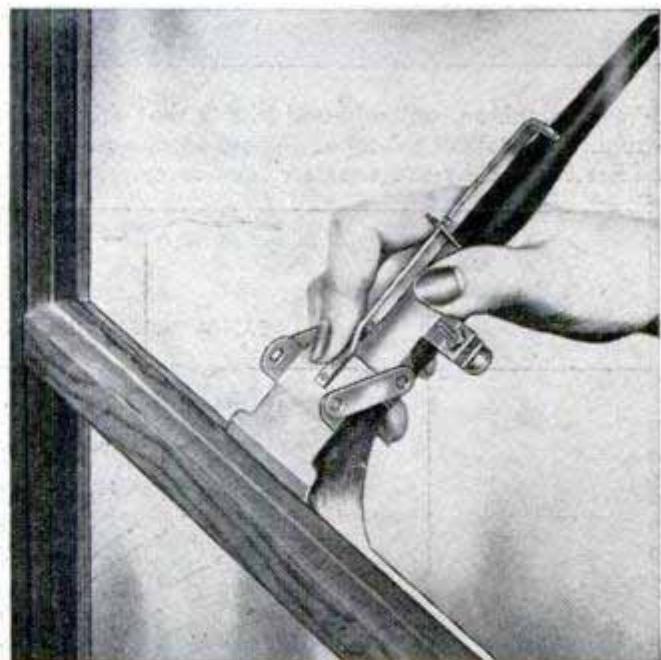
Another aviation "first" was made recently by Stanley Hiller, Jr., when he flew as a flight observer on the first pilotless cross-country flight to be made by helicopter. With an empty cockpit, the helicopter

flew 25 miles over San Francisco Bay at an altitude of 3800 feet. The flight was made possible by a control system developed by Hiller to stabilize the performance of helicopters. The machine in which the historic flight was made is a Hiller-360, a product of United Helicopters, Inc.



Tool for the Angler

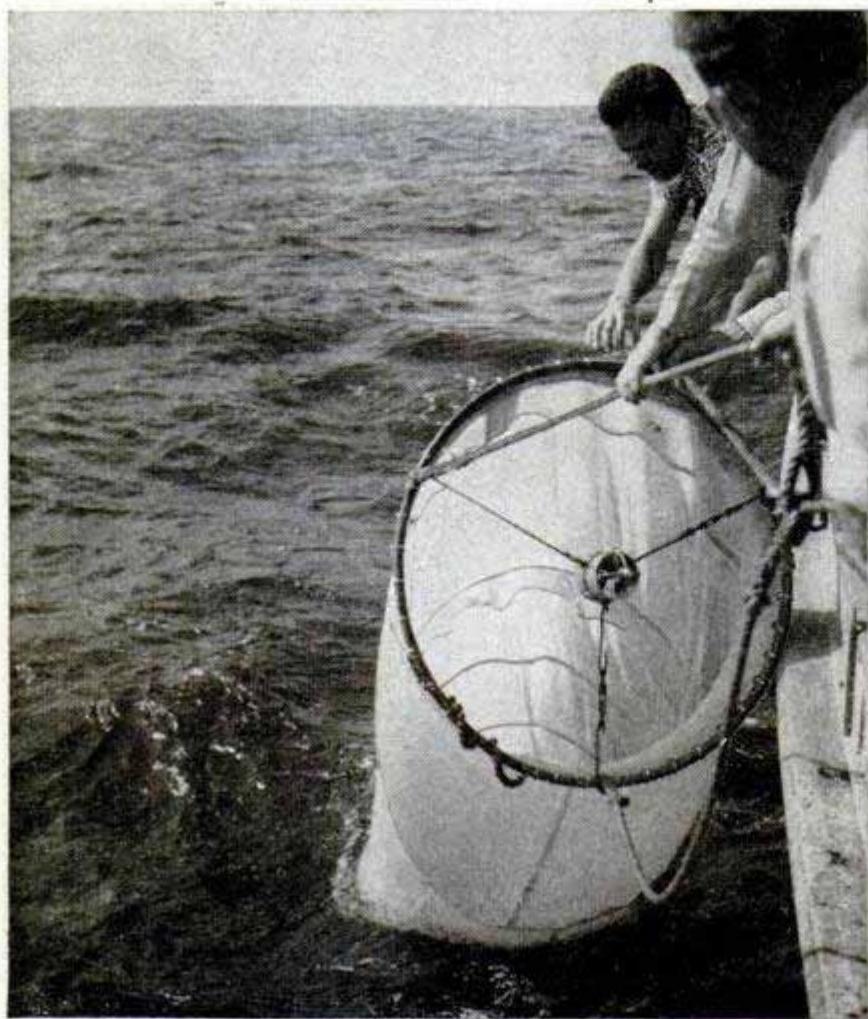
Scaling, removing hooks and picking fish from a gill net are just a few of the jobs accomplished by a versatile tool for anglers. Made of plastic, the tool can't damage lines, nets or hooks. When a hook is deeply embedded, the angler loops the line through a slot and pushes the tool down the fish's mouth. When the hook is forced out, the barb seats in a groove while the tool is pulled back out. The pointed end of the tool can be wedged into a gill net to free the fish, or used as an aid in splicing rope.



Paintbrush Guide

You can paint window sash without smearing the glass with a guide which clamps to the brush. A blade on the guide slides along the edge of the glass, protecting it from the paint. When the brush is to be used for ordinary painting, the guide slides back out of the way. It fits any 1½-inch brush and is also useful for painting trim or molding.

The Case of the Vanishing Sardine



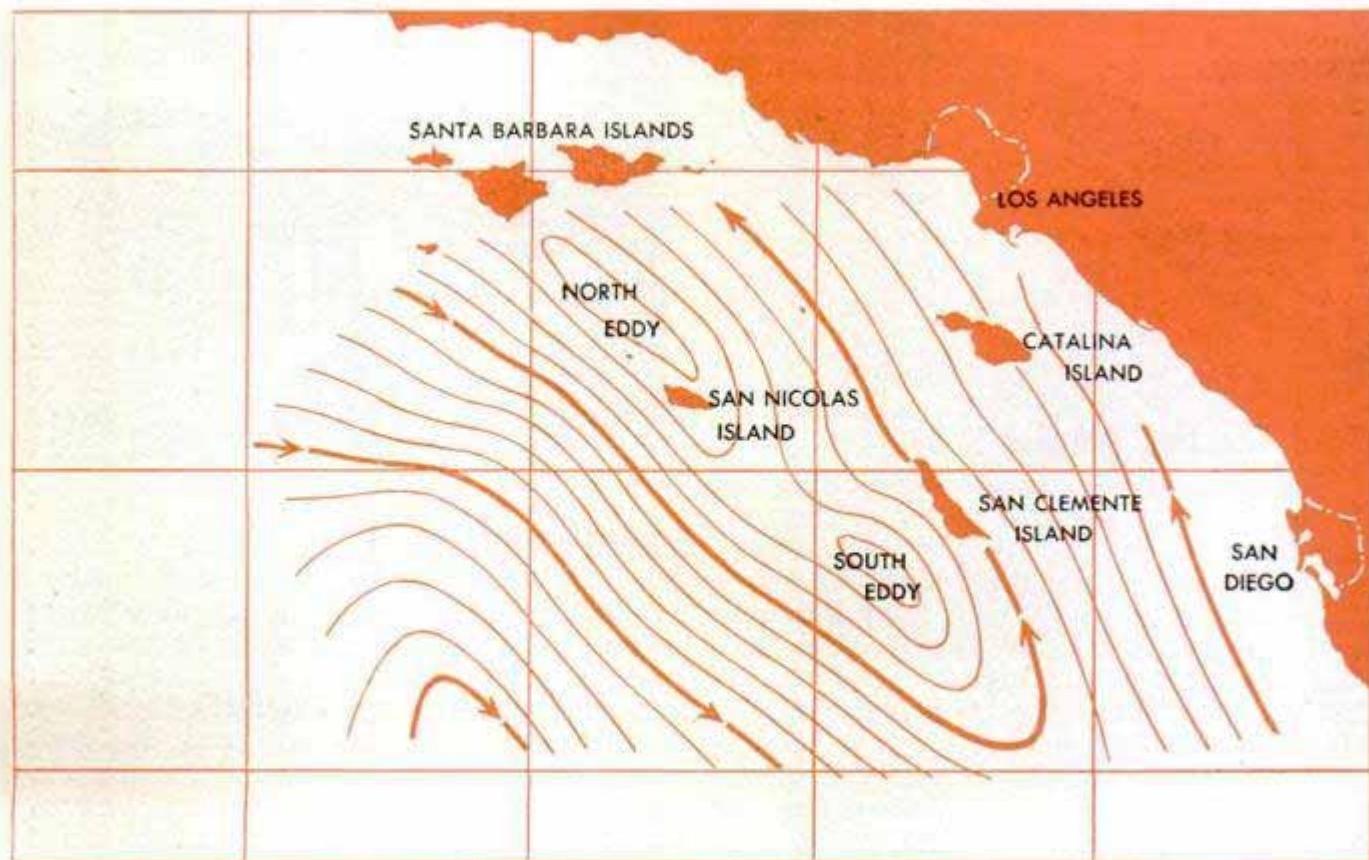
Above, plankton, animals and plants that drift with the current are caught in nets like this one. Below, sardines spawn in the two huge eddies formed by the counterclockwise current off California's coast

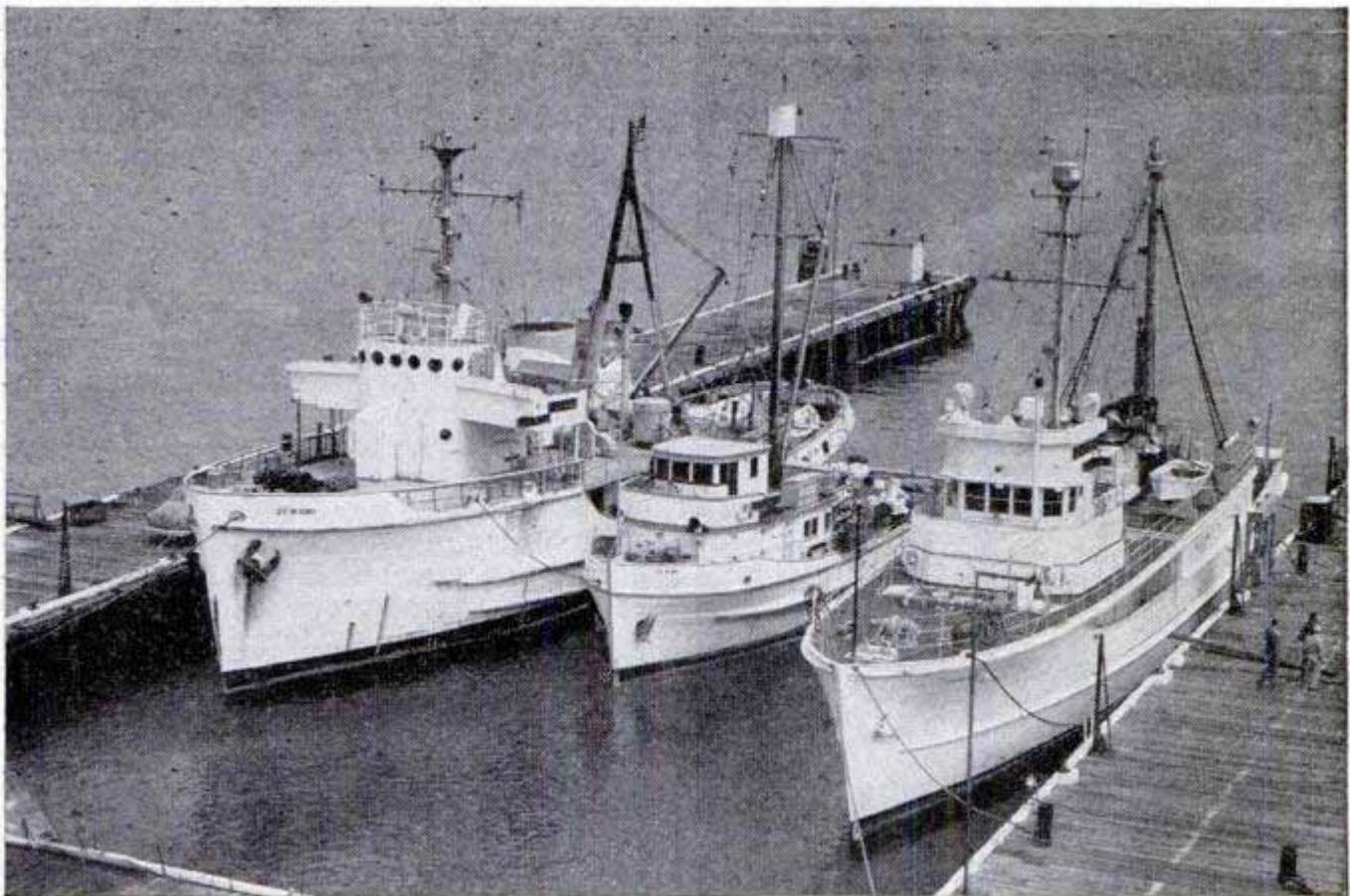
IT REQUIRES no Sherlock Holmes or J. Edgar Hoover to figure out what happened to the passenger pigeon, the buffalo or the trumpeter swan. These creatures, which once existed in large numbers in the United States, were slaughtered by men and guns.

But down in the mysterious depths of the sea it is much more difficult to explain why certain finny species suddenly disappear.

For example, the sardine. It might not be a major calamity if you never ate another sardine sandwich. Tuna or salmon might do just as well. But thousands of fishermen all over the world depend for their livelihood on catching these little fish with greenish-gray back and silvery undersides.

In recent years, off the coasts of Portugal, India, Japan and California, where 40,000 persons have depended upon the sardine for a living, the total catch has dwindled from a high of 800,000 tons to a mere 150,000 annually. This has meant a yearly





These vessels are part of the fleet that sails under the Scripps flag trying to solve the sardine mystery

loss of \$30,000,000 to California's sardine fishermen alone.

That's why three years ago they called upon the University of California to set up a Marine-Life Research Program.

In effect, they said:

"We want you to put your best fish detectives on this case and find out what's happening to the vanishing sardine."

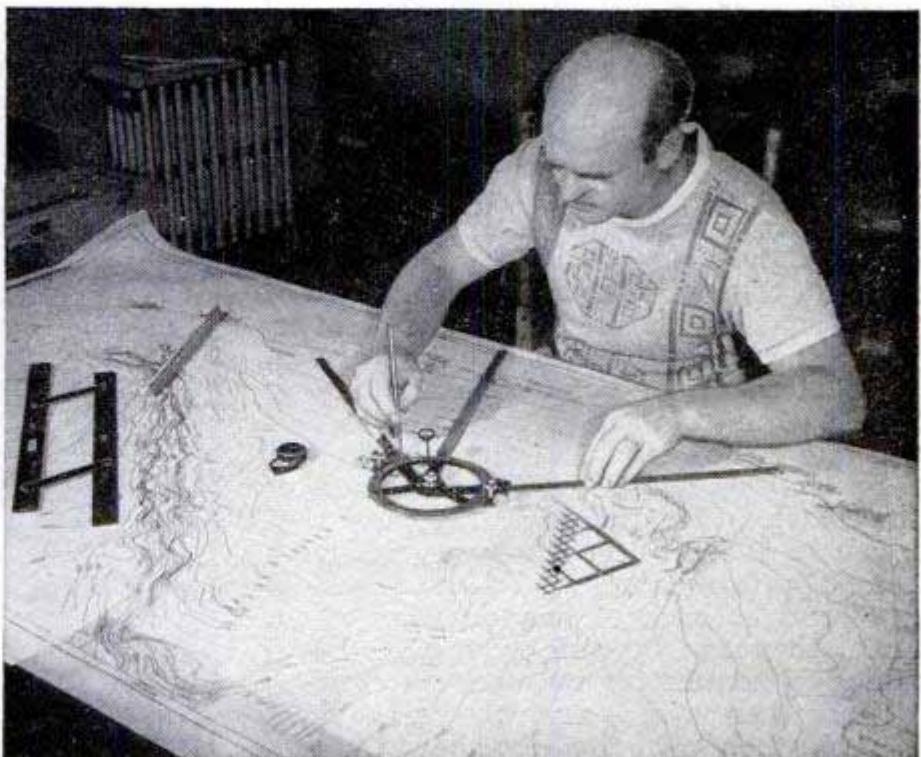
To finance the program, the California legislature appropriated \$700,000. In addition, a special tax of 50 cents a ton was slapped on all sardines netted off the California coast. Collaborating with the University of California in what has been described as "the greatest fishing expedition in history" are the California Division of Fish and Game, the U. S. Fish and Wildlife Service, the U. S. Navy and the California Academy of Sciences.

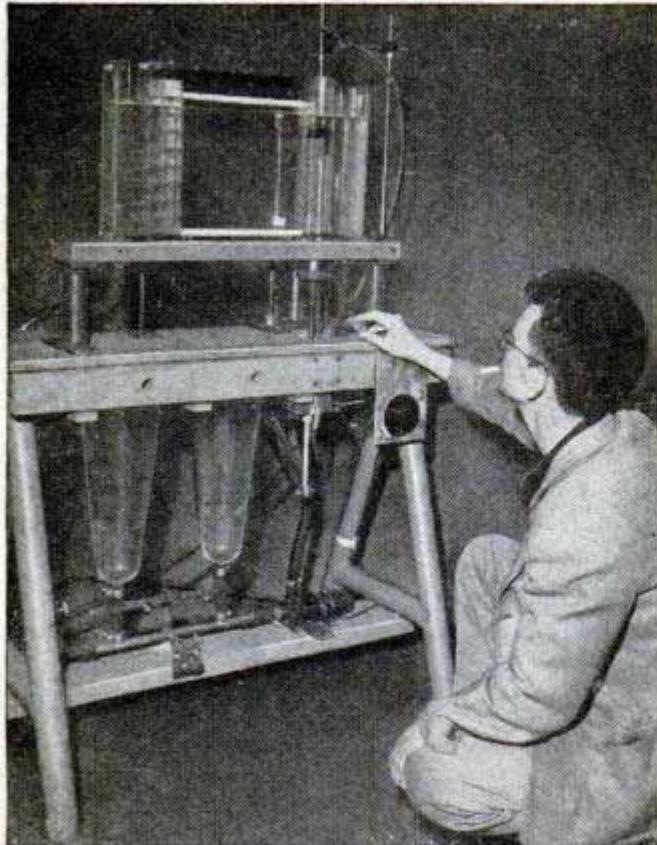
At the Scripps Institution of the university, a 110-man team has been gathered to investigate the sardine problem. It includes learned biologists, chemists, physicists, meteorologists; highly

skilled cartographers, laboratory assistants, marine technicians; and seagoing crews for the "floating laboratories" that sail the Pacific to solve the mystery of the disappearing sardine.

In charge of the project is Dr. Roger Revelle, a tall, cigar-smoking scientist who was a commander in the Navy's Hydrographic Office during the war. His colleagues jokingly call him "The Admiral."

An artist works on a topographic chart of the canyons in the ocean floor





This device, the elutriator, sorts the animals and plants brought up as samples from the ocean depths

His sardine-hunting "fleet" consists of six ships. Four belong to the Scripps Institution, two others to cooperating agencies.

These six ships are now investigating the 670,000 square miles of ocean that lie in a 400-mile belt between the Columbia River and Cedros Islands of Lower California.

Assigned to regular patrol duties are the Horizon, Crest and the Black Douglas. Every month each of these ships covers one third of the total area, stopping at "stations" 40 miles apart to take samples of sea water and sea life down to depths of 3000 feet. This means that each ship must be at sea at least 15 days a month. When storms brew and the little ships bob about like corks, it's rugged duty for the 17-man crews and the scientists aboard.

Scientists and technicians at the Scripps Institution investigate weather and currents, analyze sea water, study the tiny animal and vegetable life in the sea, as well as the commercial fish and larger sea animals. In addition, the Fish and Wildlife Service, at its laboratory on Point Loma, is studying the spawning habits of the sardines and the fate of the young, newly hatched fish.

So well equipped are the six vessels of the Marine-Life Research Program that much of the routine laboratory analyses can be performed at sea. When the results are brought back to headquarters at La Jolla, they can be quickly analyzed and added to existing information.

Fishermen over several years have evolved their own theories about the dis-

appearance of the sardines. "Temperature changes in the water killed 'em," argues one old salt. "Lack of plankton — they starved to death," says another, referring to the microscopic plants and animals near the surface on which the sardines feed. "Sea lions gobbled 'em up," decides a third man. "They migrated to other parts of the Pacific," declares a fourth.

The scientists themselves won't be ready to say what happened to the sardines until they've completed several more years of investigating all possible factors.

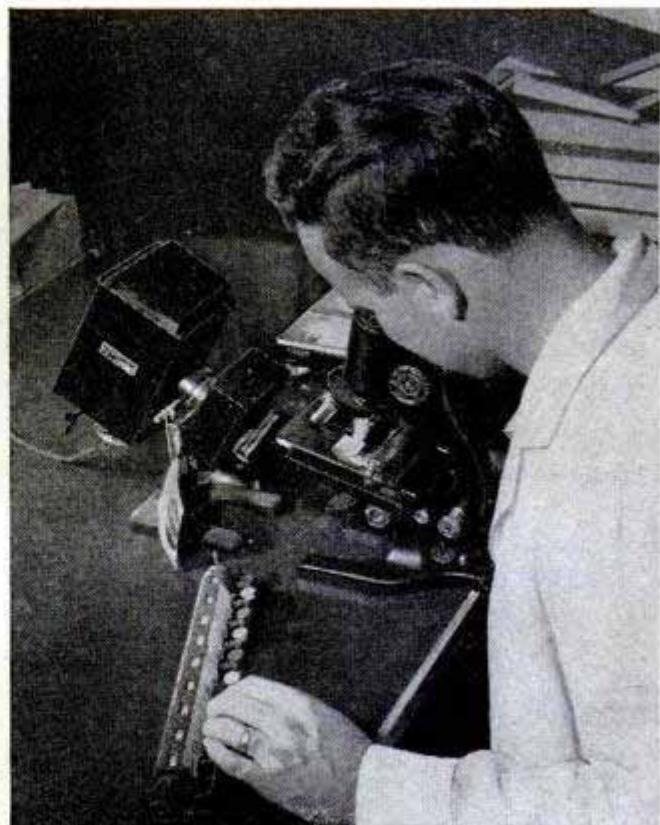
Like good detectives, however, they have some hunches, based upon experience. One of the hottest of these is that the currents of the ocean may be responsible for carrying sardine eggs and larvae away from favorable spawning grounds.

Contour maps of waters off the southern California coast indicate the existence of two huge eddies near Catalina Island which are thought to be vast sardine "nurseries." These eddies, caused by the southward-bound California current, are 60 miles wide and 200 miles long, with huge counter-clockwise movements. They change in size and location during different seasons, but tend to remain in the same general area.

In these giant whirls, plankton grow in profusion. And during the spring of the year mature sardines go there to spawn and raise their young. The baby sardines feed on the plankton and grow into adults. When currents shift and the eddies are reduced in size, the immature sardines may

(Continued to page 258)

A Scripps scientist determines the number and type of phytoplankton on a slide containing a sea sample

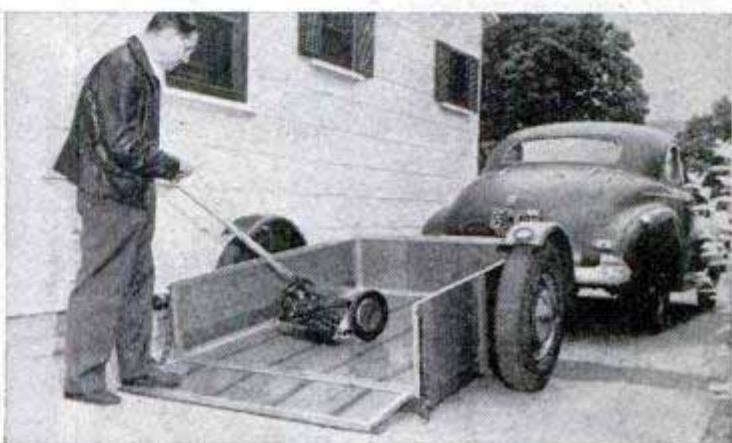




Let-Down Trailer

Loading a new automobile trailer is easy—a hydraulic cylinder drops the bed to the ground for wheeling heavy loads aboard. Pumping the cylinder by hand then raises the bed to its normal riding position. The wheels of the trailer are independently sprung on double-action shock absorbers, a system that is said to give a smooth, non-sway ride when the trailer is empty or loaded. Both the suspension and the hydraulic mechanisms are adaptable to horse and house trailers as well as utility trailers.

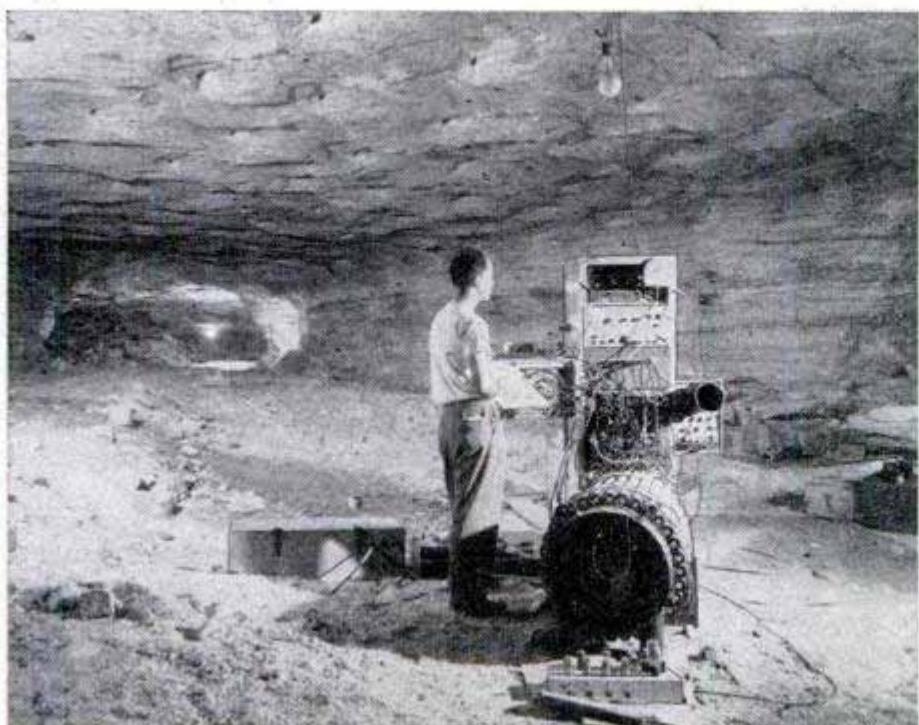
Left, double-action shock absorbers eliminate springs on the let-down trailer. Above, pump lifts trailer bed after it has been lowered to the ground for easy loading, below



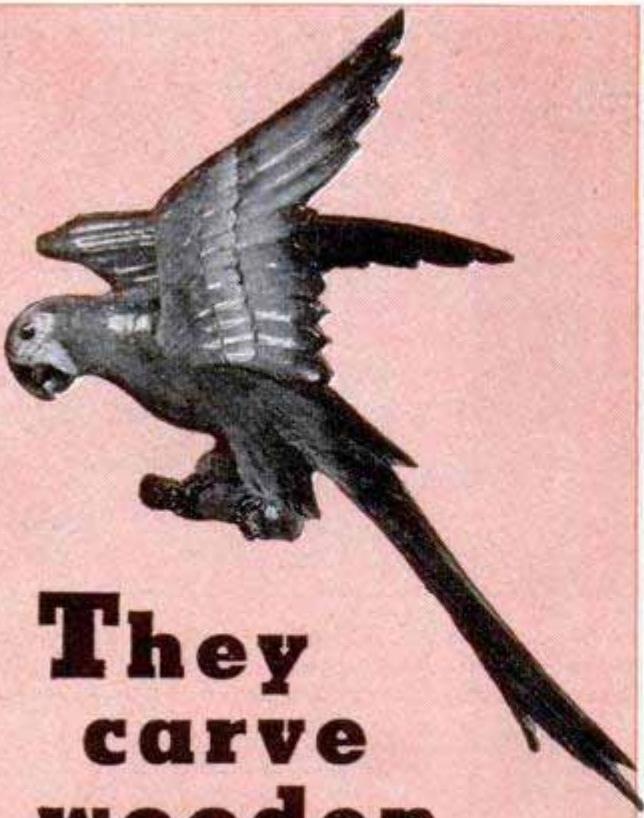
Scientist Tries Tracing Cosmic Rays Deep Underground

Science is going deep underground in an effort to learn more about cosmic rays. Lowell M. Bollinger of Cornell University

is using complex equipment of his own design in an effort to trace cosmic rays that penetrate deep into the earth. He hopes to determine how much of the cosmic radiation that bombards the earth can penetrate to great depths without losing most of its energy through collision with earth molecules. The site of his experiments is the deepest salt mine in the United States near Ithaca, N. Y. His equipment includes a cylinder which is surrounded by 48 Geiger counters.



On Feb. 5 and 7, 1892, the mercury dropped to 90 degrees below zero at Verkhoyansk, Siberia, to set the world's cold-weather mark that has never been broken.



They carve wooden birds



By Lyn Harrington

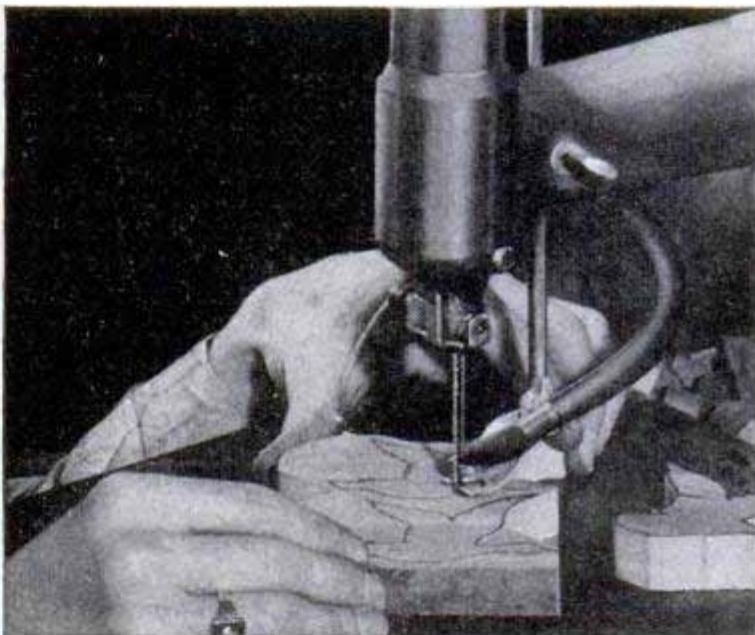
TWO TORONTO craftsmen, Marian Morton and F. H. Little, have converted a hobby into a business—making lapel pins or bird brooches. Both ardent ornithologists, they reproduce in Carolina gumwood the birds they study in native habitats.

Their bird brooches are neither conventional nor stylized in any way—except that they are flat on one side where the pin is attached. While they work in mass production, there is nothing hasty or indifferent about their work. Their finished pins bring about \$10 apiece.

A board $\frac{7}{8}$ -inch thick is rubber-stamped with the designs most in demand and the figures are cut out with a power jigsaw. Usually the blanks are turned over to carvers to rough out either in the shop or in their own homes. Three quarters carved,



Craftsmen rubber-stamp the most popular designs on a piece of Carolina gumwood. Below, they are roughed out with a jigsaw, then turned over to carvers



Photos by Richard Harrington

they are returned for the final finishing, which usually is done by Little.

While each part of the operation requires care, beaks are the trickiest part of the carving. Usually feet are not carved in wood, but are made from wire to give a more realistic effect.

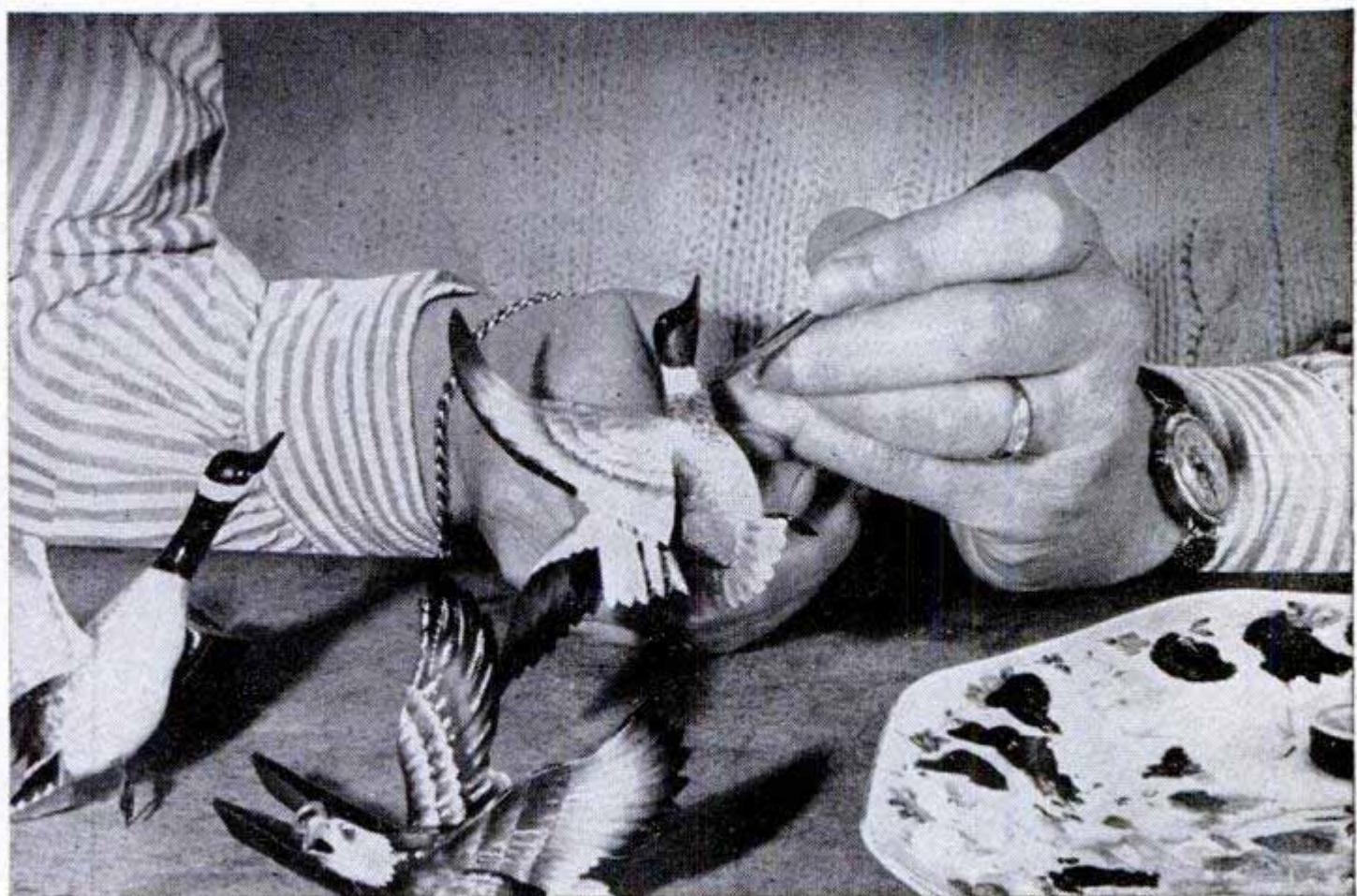
Keen eyes and a steady hand are needed for painting the birds in their true-to-life colors. Few birds require less than 20 different colors, and for the cock pheasant some 50 are needed.

Favorites with customers at summer resorts are the white-winged sea gulls. Ducks, geese and the American eagle are the tourist's choices.

The Toronto craftsmen have found both satisfaction and profit in building their hobby into a business.



As many as 25 different chisels are used in finishing the carving. Below, after a pin has been attached to the back, each bird is painted. Most birds require 20 different colors and the cock pheasant about 50



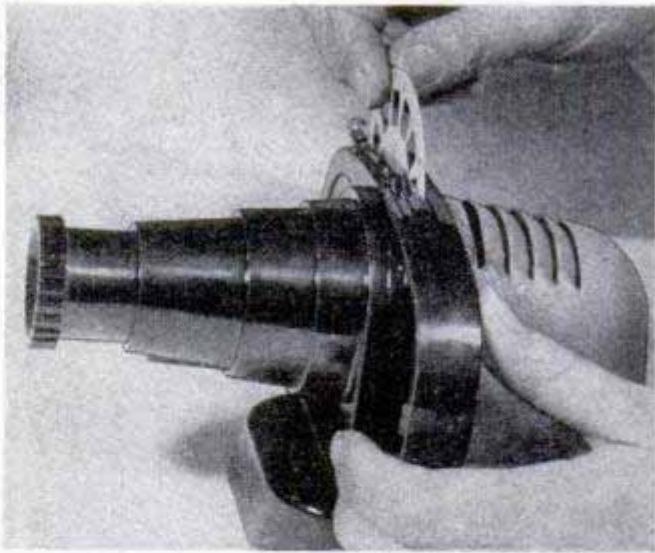
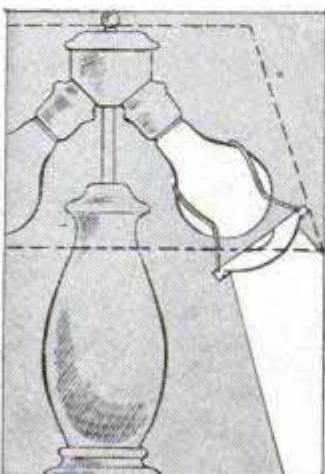
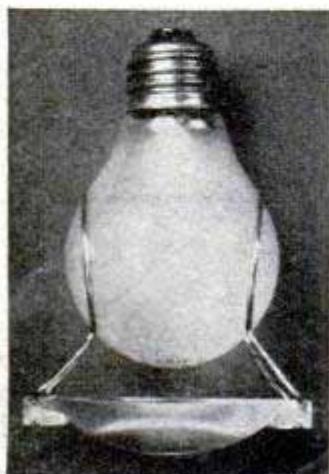


Lighter "Exhales" to Prevent Leaks

Inside a new cigarette lighter is a rubber sack which prevents the fuel from leaking as a result of changes in the air pressure. Frequently, lighters and fountain pens leak during airplane flights, or when they are suddenly carried from a cold to a warm room. The rubber sack inside the new lighter compensates for the sudden expansion of air by expelling air from the fuel chamber. Made of transparent Lucite, the lighter has a visible fuel supply.

Lens Increases Light Intensity

Concentrating the light rays of an electric-lamp bulb, a small glass lens produces a bright area with about twice the light intensity of the unaided bulb. Designed to direct the light where it is needed, the lens is said to double the light without creating any bothersome shadows. Two wire clips on the lens snap over the bulb to hold it in any desired position.

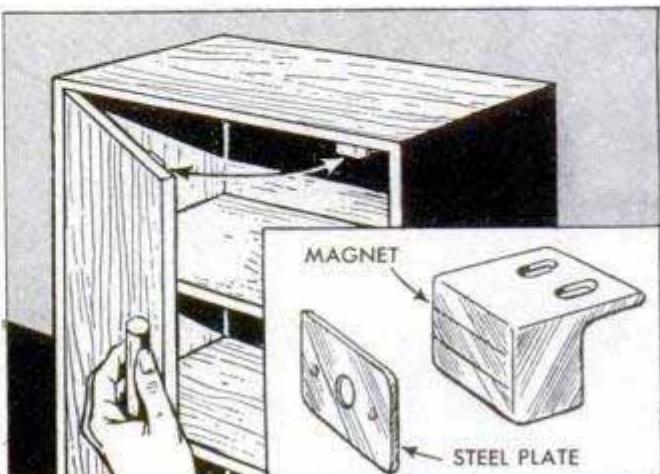


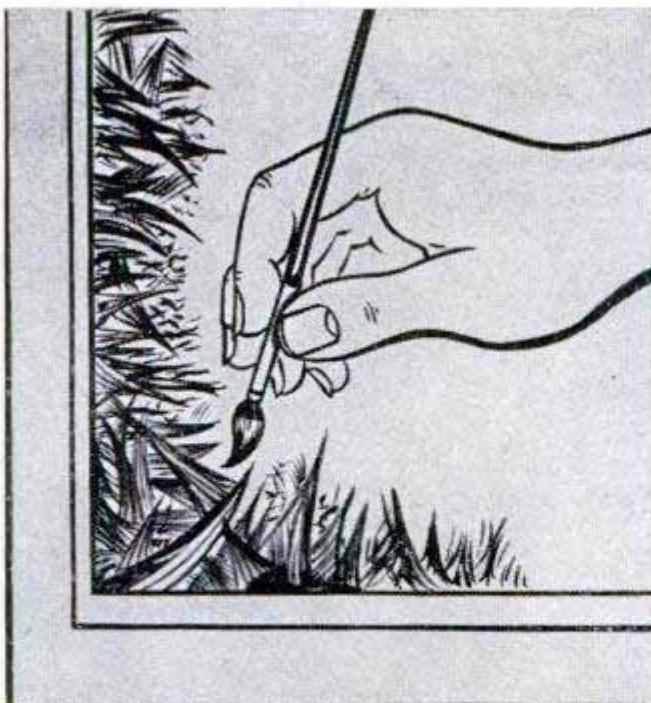
Midget Projector

Both grownups and youngsters can have fun with a small projector that projects specially mounted Kodachrome pictures. The projected picture from a throw of six feet is 11 by 12 inches and focusing is controlled by a knurled ring on the projection lens. A heat-absorbing shield envelops the 30-watt lamp and promotes air circulation. The pictures are mounted seven to a disk for inserting in the machine and are kicked forward with a trigger mechanism. The inexpensive disks include travel scenes throughout the world, Christmas and fairy stories and many other subjects. Kodachromes are mounted for three-dimensional use with a stereoscopic viewer also made by the same manufacturer. This 115-volt unit will operate on a.c. or d.c.

Magnetic Cabinet Latch

Magnetism is used as the holding power in a new cabinet latch. The latch consists of a small but powerful magnet which is screwed to the cabinet shelf. A special steel plate is attached to the door just opposite the magnet. When the door is closed, the magnet holds the plate firmly. The small magnet is said to last a lifetime without losing its power.





Plastic Changes to Frost

For Christmas decoration, frostlike crystal patterns can be formed with a new plastic liquid. Made in nine colors and clear, it can be brushed, dipped or sprayed on metals, glass, ceramics or plastic. It can be rubbed off with a cloth dipped in acetone or lacquer thinner, or scraped off with a razor blade.

Three-Inch Layer of Wind Blows 1200 Miles an Hour

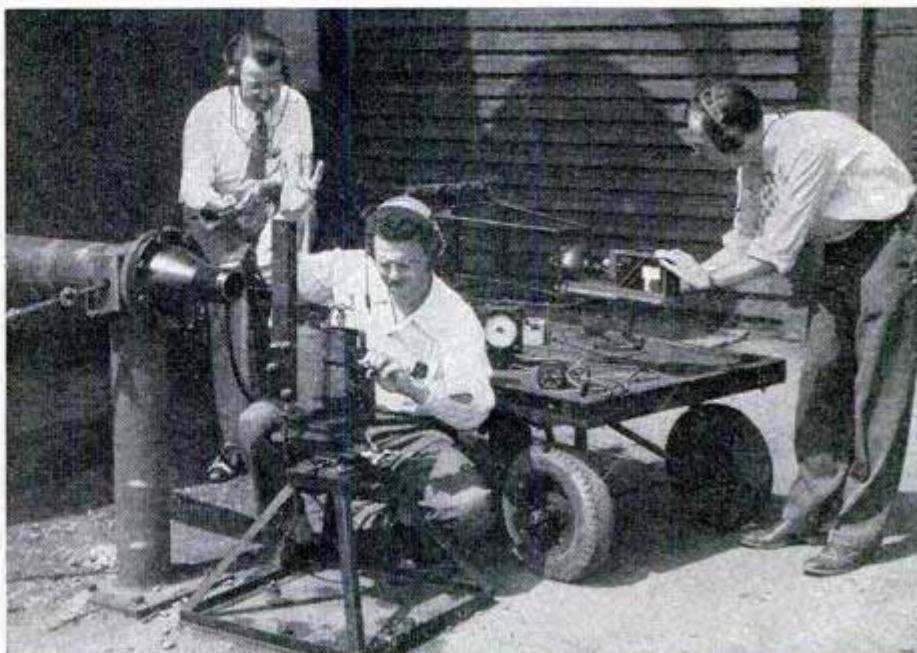
Air pours at a 1200-mile-an-hour rate from a three-inch jet built by Curtiss-Wright for basic research in air-flow phenomena. So strong that not even a hand can be thrust into it, the jet creates a roar so loud that near-by workers have to wear ear stoppers and headphones. Pressure tubes hooked to the nozzle lead to an instrument panel which records the air speed.

More than half the weight of a typical plant is drawn from the air.



Bubbler Also Cools Bottles

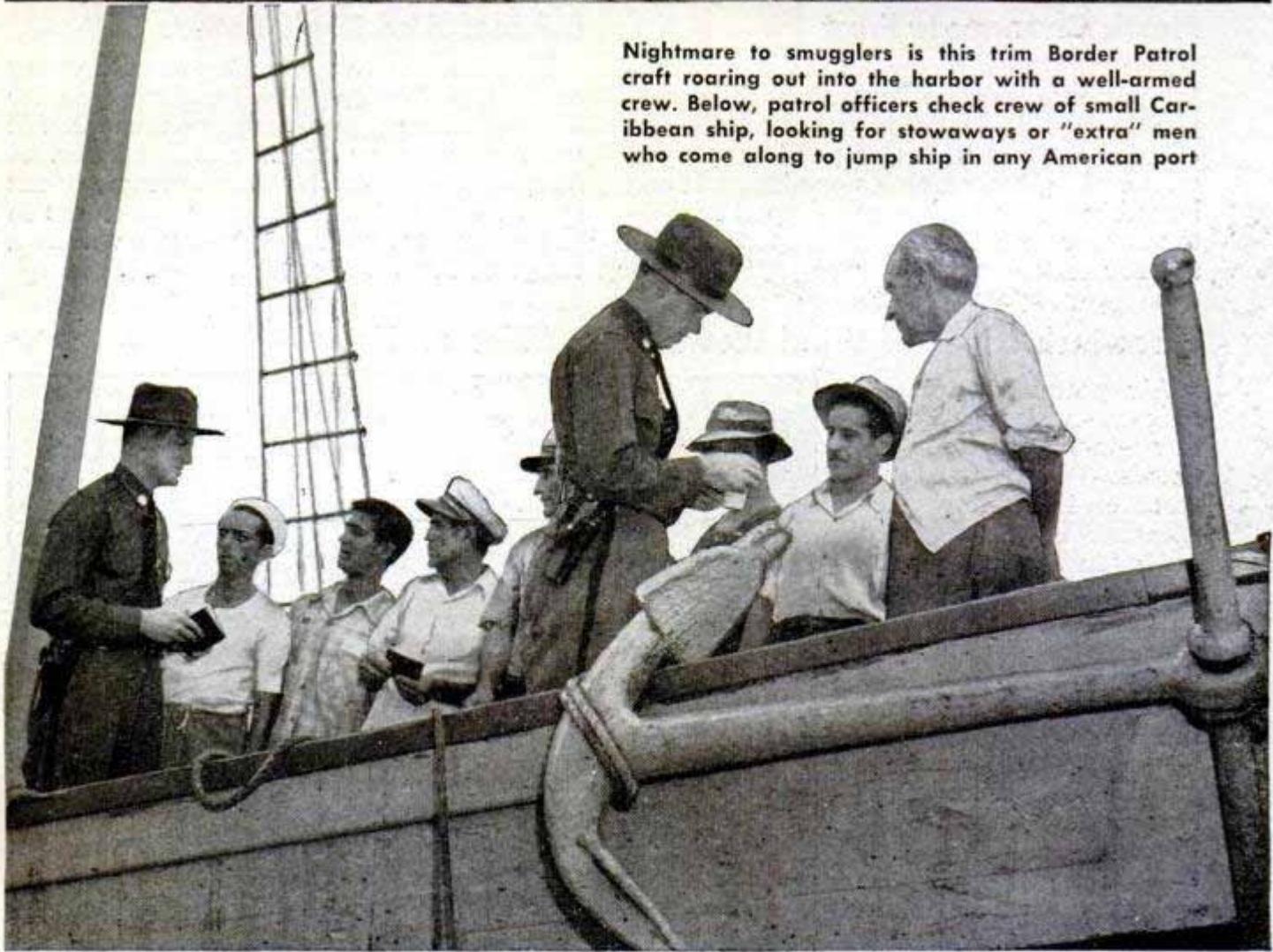
You can have your choice of cold water or bottled beverages with a new cooler that has a separate compartment capable of cooling as many as 28 small bottles. A hinged door on the beverage compartment can be locked if desired. Temperatures in the compartment are adjustable within a range of 36 to 46 degrees.



Curtiss-Wright photo



Nightmare to smugglers is this trim Border Patrol craft roaring out into the harbor with a well-armed crew. Below, patrol officers check crew of small Caribbean ship, looking for stowaways or "extra" men who come along to jump ship in any American port





If patrolmen on this plane see a suspicious-looking boat nearing Florida waters, they can spread an alarm by radio and a patrol boat will be dispatched in a hurry to search the vessel. Florida is today the favorite target of organized alien smuggling



SALTWATER BORDER PATROL

By Verne O. Williams

THOUSANDS of aliens from Europe and Asia are trying to gain illegal entrance to the United States — the promised land. Barred because of war crimes and other blots on their record, or unwilling to await their turn on the immigrant quotas, they try to slip across the borders by plane, boat or subterfuge.

Opposing this flood is a mere handful of inspectors in the Border Patrol, the tough right arm of the Immigration and Naturalization Service. Their grimmest problem is the heartless alien smuggler, often capable of murdering his human cargo to avoid capture.

The watch on the Mexican border deals with the largest number of illegal entries, but these are largely migrant agricultural workers. Ports all around the coasts must be watched for stowaways and crew deserters. But the favorite target of organ-

ized alien smuggling today is Florida, explains the 6th district immigration director, W. F. Miller.

A few minutes by air from Miami lies the island republic of Cuba, host today to more than 300,000 aliens of every nationality, all waiting for a chance to duck over to the States. They are in Cuba on visitors' permits and not allowed to work. Many see their funds diminishing and become desperate.

Recruiters for the smugglers, passing the word stealthily among the international colonies in Havana, line up groups, extracting half the fare of \$500 to \$2000 in advance. Their destination if by small boat will likely be a secluded harbor in the Florida Keys, or if by plane, an isolated inland air strip.

Defense operations of the Border Patrol in a sector extending from the North Carolina border south around Key West and up to the Apalachicola River are directed by radio from Miami headquarters. By plane, fast cruiser, swamp-gliding "airboats," and patrol cars, radio-directed inspectors can converge on a smuggler.

Obviously, the 58 harassed border patrolmen strung out along this 2371 miles of sea frontier cannot watch every harbor and inland airfield. The key to their success, says chief inspector Frank Hornyak, is that every man on the Border Patrol works



Nerve center of the Border Patrol is at Miami where raids by plane, boat and car are synchronized by two-way communication setup



Jeep tows the Patrol's airboat (note propeller) into the Everglades as far as possible. The boat skims over the "river of grass" area (below) at 40 m.p.h. and it can jump over small logs and low brush



at making hundreds of friends in strategic spots who will act as the eyes and ears of the service. These range from millionaires with beach homes to coastal fishermen, from dock laborers to airport managers. The system works.

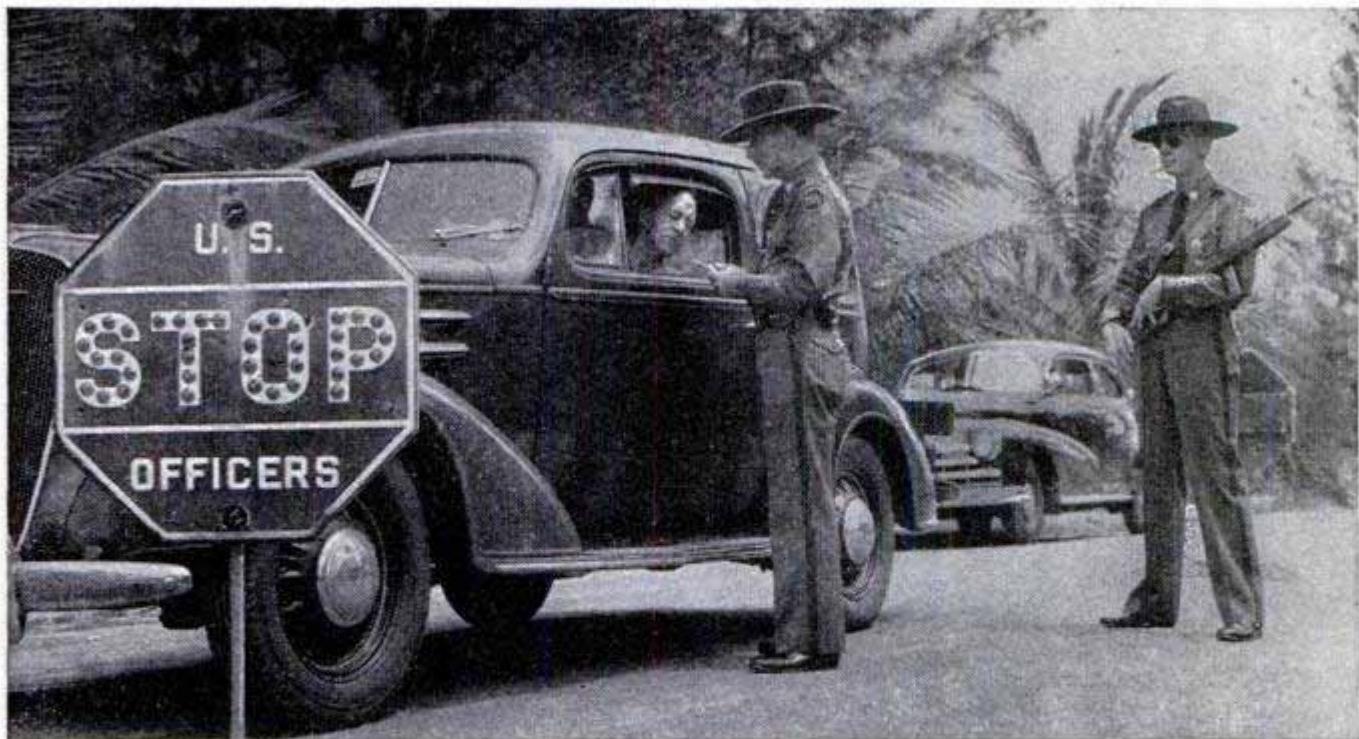
Relaxing on the porch of her ocean-front home on glamorous Miami Beach, a sleepy society matron idly watched the dappled pattern of moonlight on the surf. Just as she was about to retire she suddenly realized a part of the pattern had unmistakably taken the form of a boat. Showing no lights on its dark hull or spars, it was slowly edging toward the beach.

She went to her telephone, and a few seconds later two Border Patrolmen walked down to the beach. After hearing an anchor splash, one patrol inspector doffed most of his clothing and swam quietly out to the mysterious vessel.

As he gripped its gunwale he overheard a discussion in foreign accents. The subject concerned the best way to enter the Miami harbor without getting caught. When the hum of speedboat motors reached the occupants of the anchored vessel across the dark water half an hour later, they became alarmed and prepared to weigh anchor. But they were rudely interrupted by a dripping figure that suddenly emerged from the sea over the stern.

"You're under arrest by the U. S. Border Patrol!" said the figure, who might have been a man from Mars for the nerve-shattering effect he had on the five astounded aliens. He made them turn on the vessel's running lights and a Border Patrol speedboat, called by the inspector on shore, quickly came alongside. Another attempt to penetrate the border watch had failed.

The smashing last year of the biggest air-smuggling operation in border history came about after a tip by a forewarned airport manager. When he saw the face of an Oriental fleetingly in the cabin



Road blocks are strategically placed so that smugglers' cars will come upon them too late to turn around

of a red Cessna that stopped for gas at his Fernandina, Fla., air strip, J. L. Haverstick gave its number to the Border Patrol.

The break was not accidental. Miami headquarters had wind of the aerial activities, and every man had been out warning airport personnel. The smuggling ring had put 34 aliens, including 25 Chinese, in the States by flying from a Cuban field to a point in the South for refueling and thence north to New York. But the tip-off trip was the last. The plane was watched, and the pilot, on his return to Miami, confessed.

These cases were colorful and dramatic, but behind them goes on a routine which is responsible for the unpublicized majority of apprehensions. Bus and railroad stations are watched, and in a large port like Miami one inspector daily checks the bookings of the city and county jails.

For instance, one warm summer night in the Florida Keys two border men riding car patrol were turning in and out of boat landings when they came on a parked roadster containing a romancing couple. Politely dimming their lights, the border men drove away. But as he slapped at the mosquitoes that had poured in through the windows during the brief pause, one inspector began to think.

It was a very calm night and consequently alive with mosquitoes from the mangrove pools. How could that couple stand them? His partner agreed with his suspicions and they quietly returned with lights out. This time the couple was unhappily fighting mosquitoes.

The border men sat out the mosquito siege themselves for what proved hours. Finally, boat motors thrummed across the

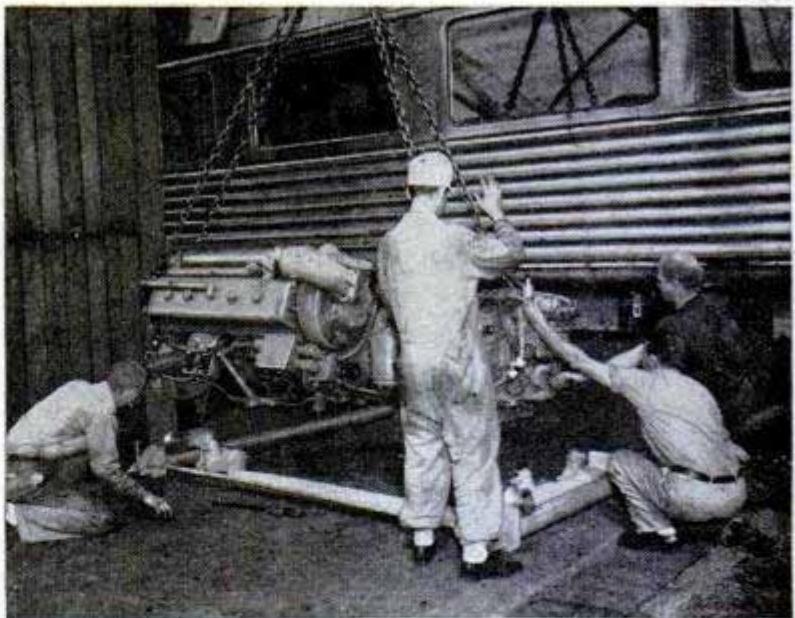
little bay. The lookout roadster blinked its lights three times. And a little later a surprised gang of smugglers found themselves caught with their cargo of aliens.

In one case, fishermen in the labyrinth of the Ten Thousand Islands region spotted 10 Chinese nearly dead from thirst on a tiny mangrove islet. Ever so often the skeletons of other unluckier groups are discovered along these uninhabited shores where the saw-grass wilderness of the Florida Everglades meets the sea.

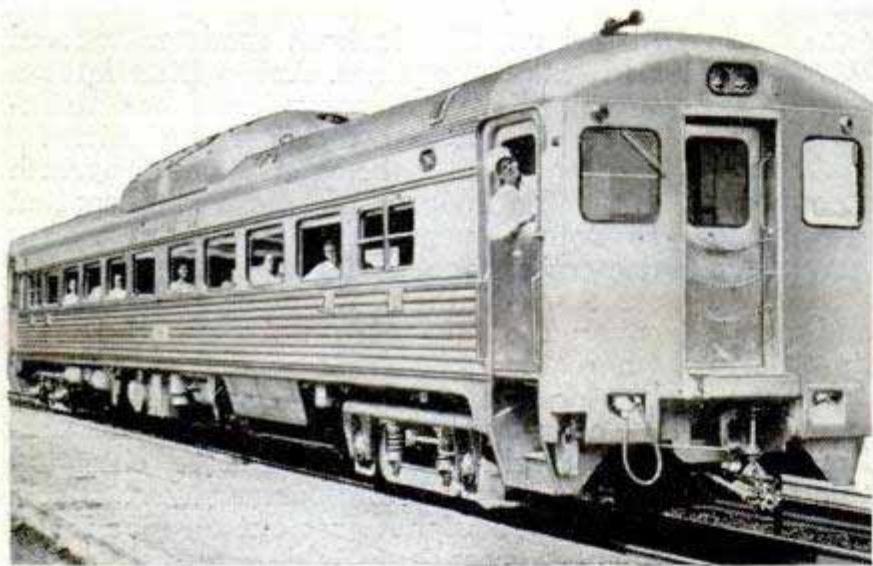
To find out if landed aliens could possibly "walk out" of the Glades, chief inspector Hornyak and partner M. A. Black, carefully equipped, set out on foot to attempt to cross Cape Sable, a feasible route. They struggled across crocodile-infested creeks, through snake-filled mangrove jungles, used up all their drinking water in the intense heat, and finally emerged many hours behind schedule. Their experiences convinced them the Glades would be a deathtrap for unequipped aliens.

Several years later Seminole Indians reported seeing the tracks of white men deep in the Glades. Employing an Army weasel, a tracked amphibious vehicle, Hornyak and R. C. Barron traced the tracks of three shoeless walkers for miles, watching them grow faltering and erratic, until they disappeared in a dense hammock. Hornyak feels certain they were aliens.

Nevertheless, the Border Patrol uses plane and swamp-gliding airboats to watch this region. Despite the perils and high fees demanded by postwar smugglers, the men know thousands more unwanted aliens await any chance to slip through the border watch.



There's a small engineer's compartment in vestibule at each end of the car. Power is transmitted through a torque converter up to 57 miles an hour, when transmission automatically locks into direct drive. Right, engine can be replaced with new one within an hour

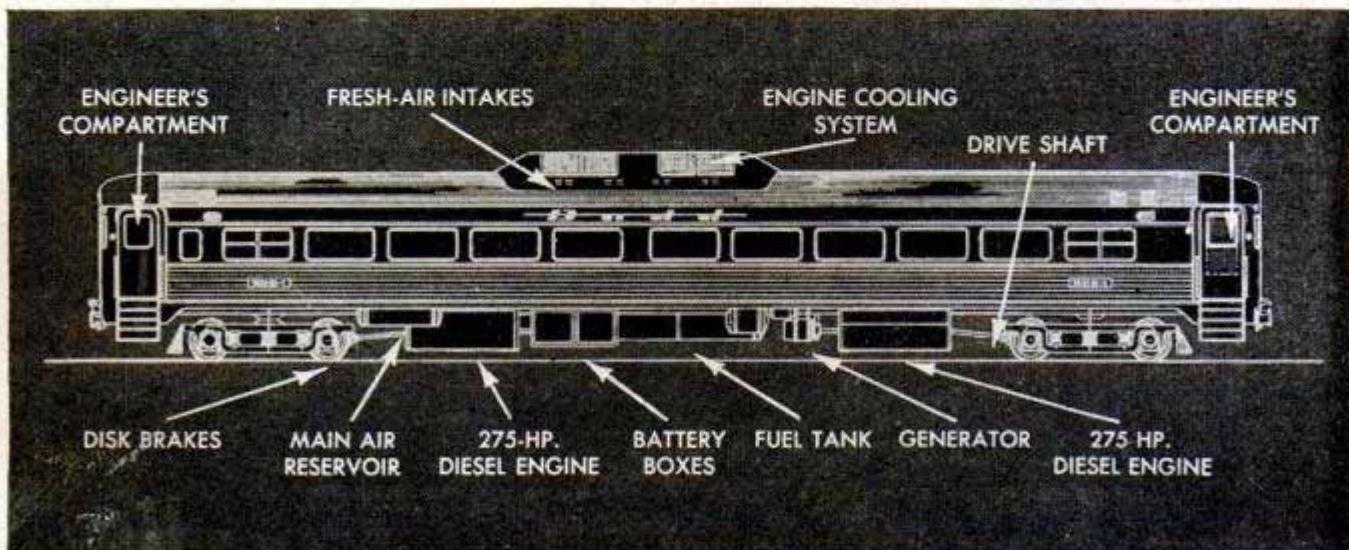


Car seats 90 passengers with no revenue space occupied by the engines. Two other models have fewer seats but mail and baggage compartments

Note engine cooling system in the blister atop car. All other equipment is built into space between trucks, which lowers center of gravity

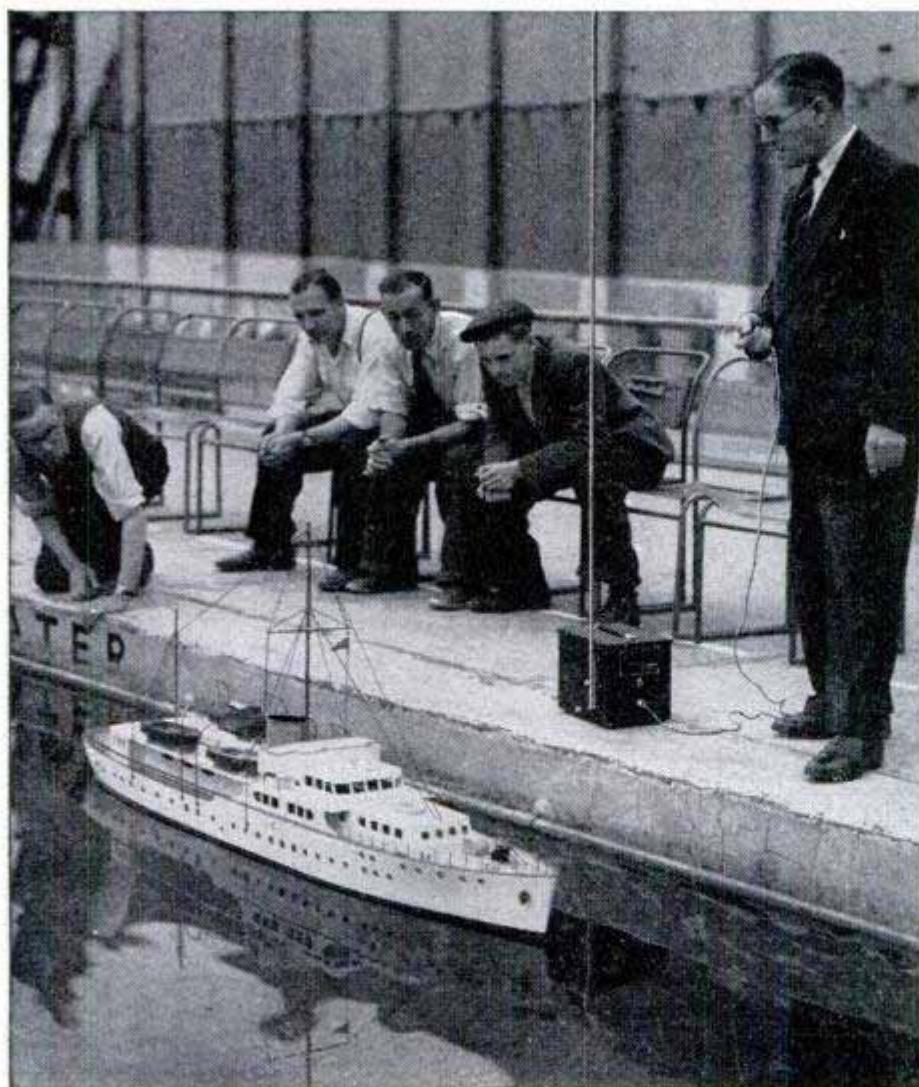
Passenger Car Rambles the Rails Under Own Power

Don't be surprised if you see a lonely passenger car cruising the rails at 80 miles an hour without a locomotive in sight. It will be the self-propelled rail car, recently built by the Budd Company, which has two 275-horsepower diesel engines slung between the trucks. The cars can be operated alone, or several of them can be coupled together to form a complete train. Like a trolley, the car has engineer's controls at both ends, and one engineman can operate any number of cars. Biggest advantage of the car is that none of the passenger space is taken up by the engines or controls.



Parachute Plane

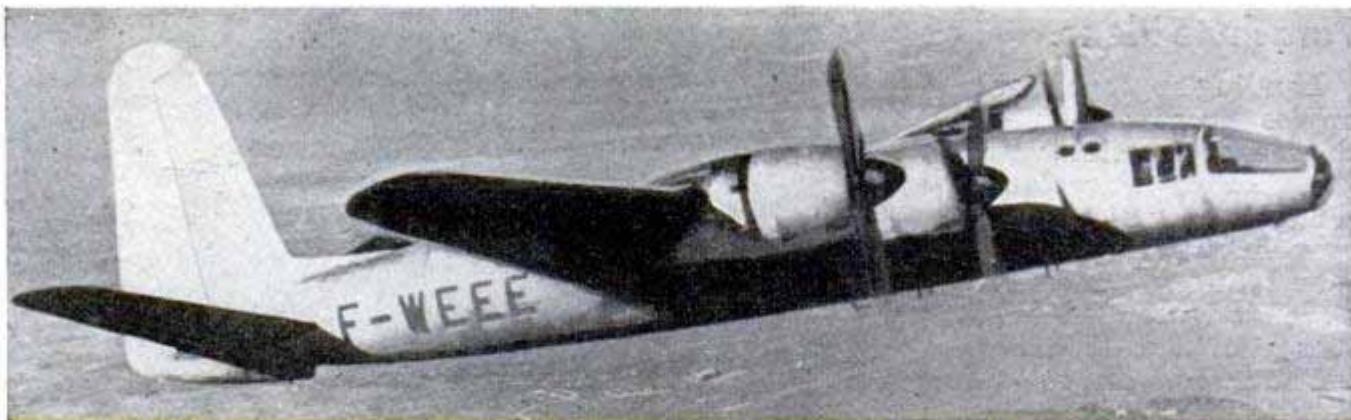
Landing approaches at angles greater than 40 degrees are possible with the Lanier Paraplane, which acts as its own parachute in case of engine failure. It takes off or lands within 200 feet, flies from 30 to 120 miles an hour and can't spin. Key to its parachutelike performance is a gull-shaped wing that forms a trough, or air cell, around the two-place cabin. The wing's shape is controlled from the cockpit, where levers operate scoops and slots to give varied effects of air brake, flap and lift control. Though 20 feet long and the same distance across the wing tips, the wings can be folded for storage in an area 8 by 20 feet, the size of an ordinary garage. The plane is powered by a 90-horsepower engine.



Radio-Guided Model To Try Channel Trip

There'll be no one aboard a new yacht when it makes an attempt to cross the heavy seas of the English Channel soon. The yacht is a model, six feet long, complete with lifeboats, anchor and smokestack. Designed and built by H. W. Eastaugh of England, the craft is guided by remote radio control. During the cross-channel try it will be operated from a boat which can cruise as far as three miles from the model and still maintain effective control. The yacht's top speed is six knots.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT index, which is available without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11



Intended for high-altitude reconnaissance and photography, the SE 1010 cruises at 325 m.p.h.

For armament the SO 6020, a long-range jet fighter, carries four machine guns or six cannons

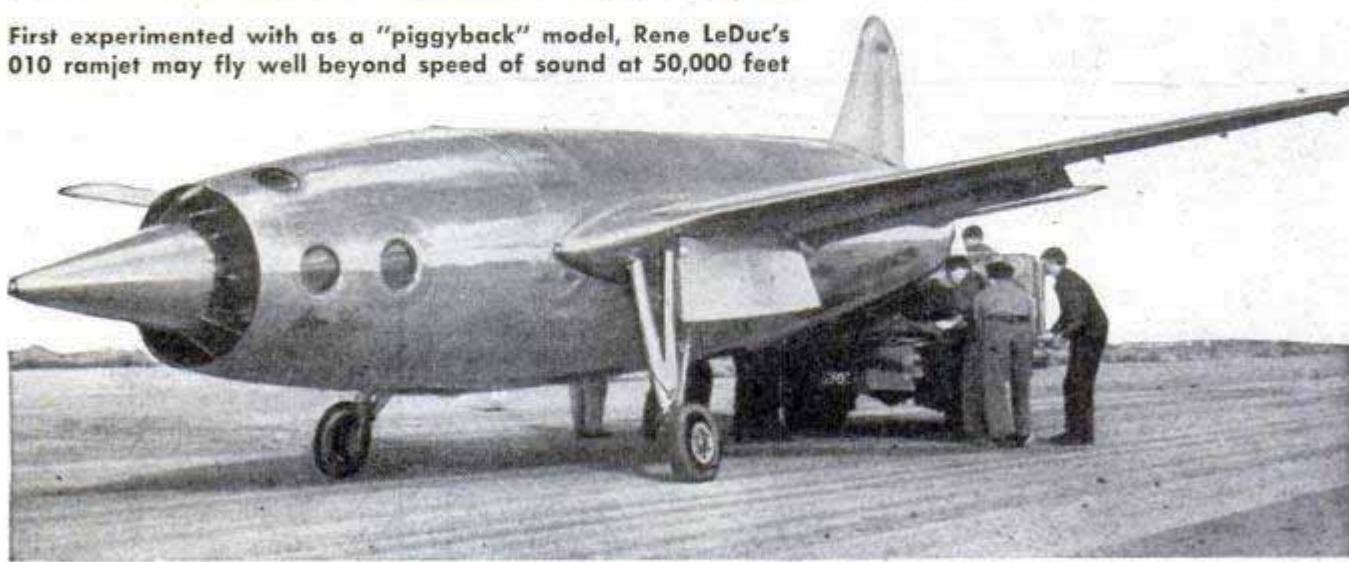
French Air Information Service photos



First experimented with as a "piggyback" model, Rene LeDuc's 010 ramjet may fly well beyond speed of sound at 50,000 feet

TODAY'S FRENCH PLANES

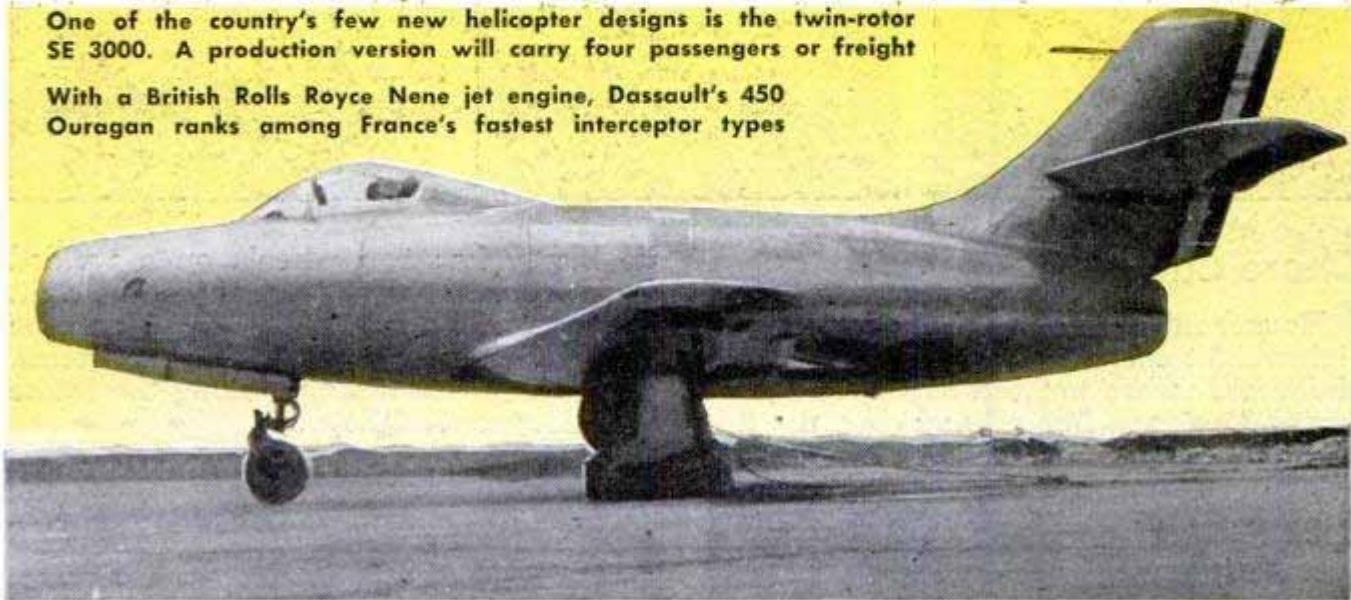
UNUSUAL shapes dominate new French aircraft design. One of the oddest is Rene LeDuc's spear-nosed 010 ramjet, which has already exceeded 560 miles an hour, using only half power. The 010 is essentially a flying stovepipe, powered by five burners, with fuel comprising one third of its three-ton weight. Another strange looking craft at the Paris Air Show was the stubby NC-1070, a carrier-based torpedo plane. Built short for shipboard operation, its two jet-engine nacelles are almost as long as the 33-foot fuselage. Fourga's turbojet glider, with a V-tail and a tiny, 80-pound power unit mounted on its back, takes off on its own and flies 160 miles an hour at 10,000 feet. Known as the CM8 R 13, it has a 35,000-foot ceiling and a 150-mile range.



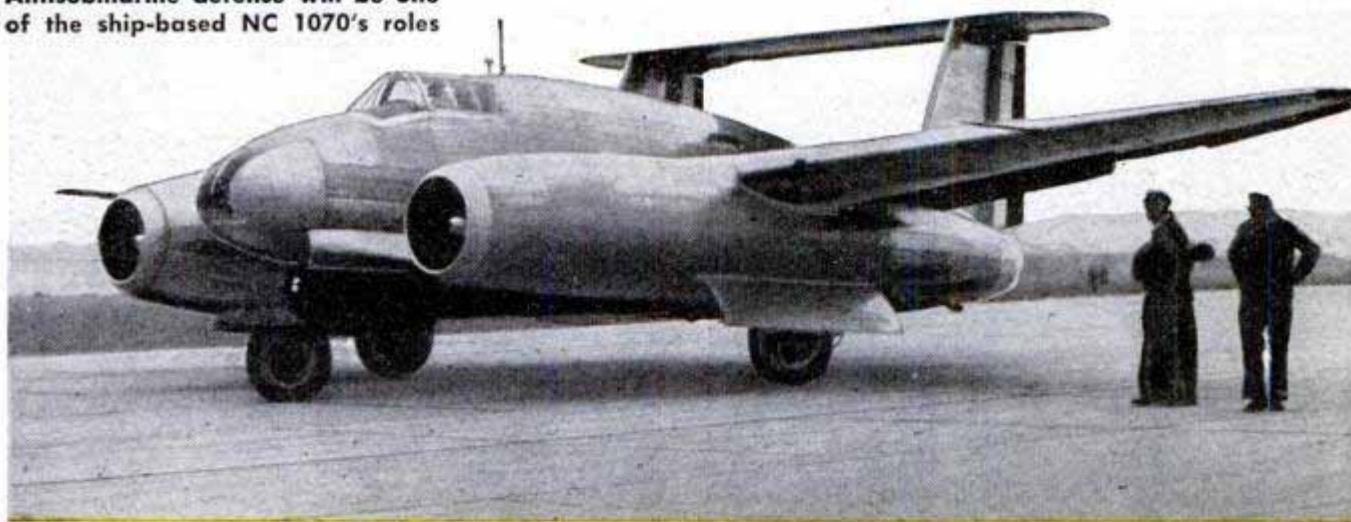


One of the country's few new helicopter designs is the twin-rotor SE 3000. A production version will carry four passengers or freight

With a British Rolls Royce Nene jet engine, Dassault's 450 Ouragan ranks among France's fastest interceptor types



Antisubmarine defense will be one of the ship-based NC 1070's roles



Developed for European sky routes, the piston-powered SO 30P Bretagne carries 37





Chore Cart

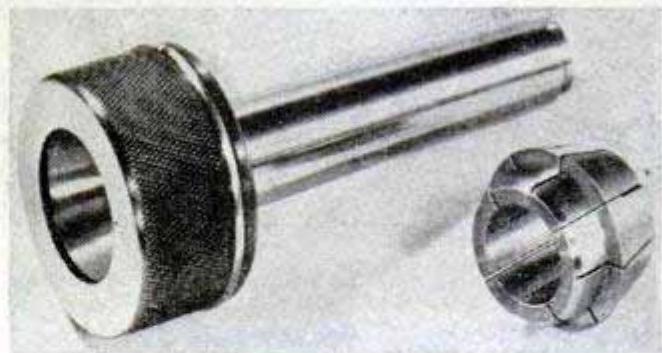
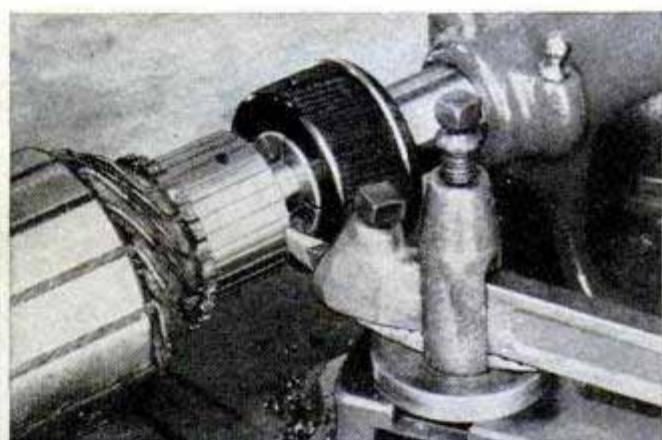
Household chores are made easier by a lightweight cart that totes anything from the weekly wash to trash barrels and groceries. Designed like a hand cart, the lit-

tle buggy has two wheels on a welded frame. A shelf pivots down at just the right height to hold a laundry basket. When the cart is to be used for carrying larger items, the shelf can be tilted up along the frame where it is out of the way.



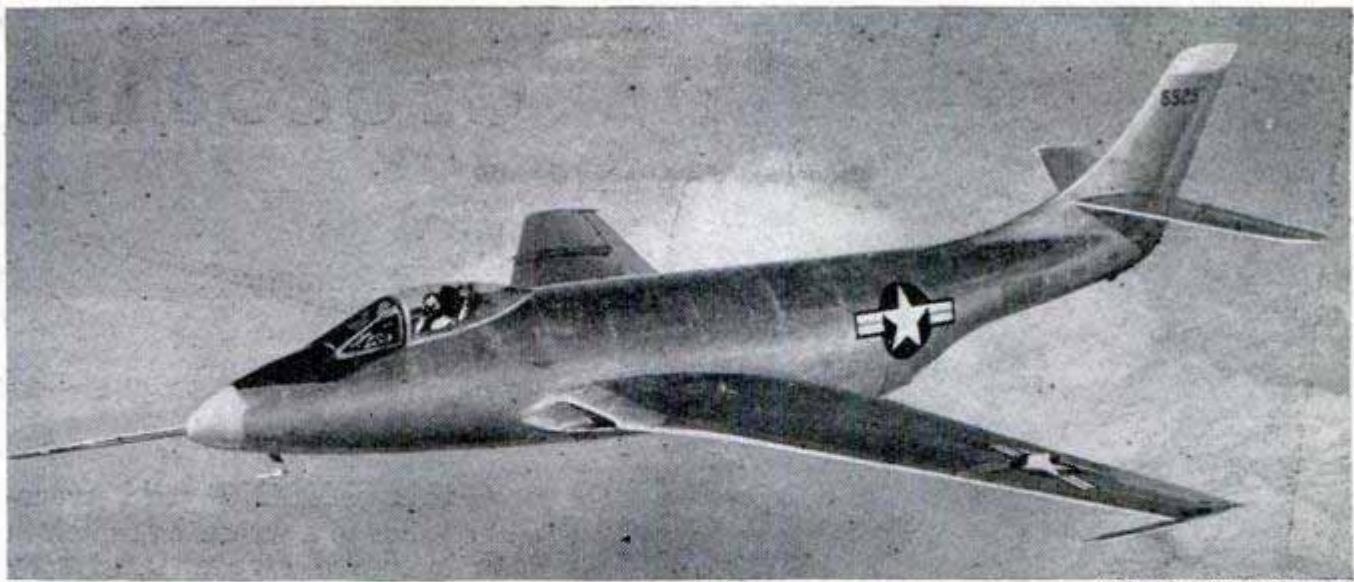
Heated Hunting Blind

For hunters who like comfort with their sport, a portable blind folds into a package 12 inches in diameter and 5½ inches thick. It can be carried in an accessory wood case which converts into a seat and will accommodate a small stove and a lunch kit. The blind is covered with weather-resistant fabric, has a 12-foot circumference and is 46 inches high.



Chuck Holds Centerless Shafts

Centerless shafts such as those in many automobile starters and generators are held concentrically in a lathe by an adjustable chuck. Any shaft $\frac{1}{4}$ to one inch in diameter can be accurately centered with the chuck. The attachment can be used in the lathe headstock to hold and drive the work or adjusted in the tailstock for an accurate running fit.

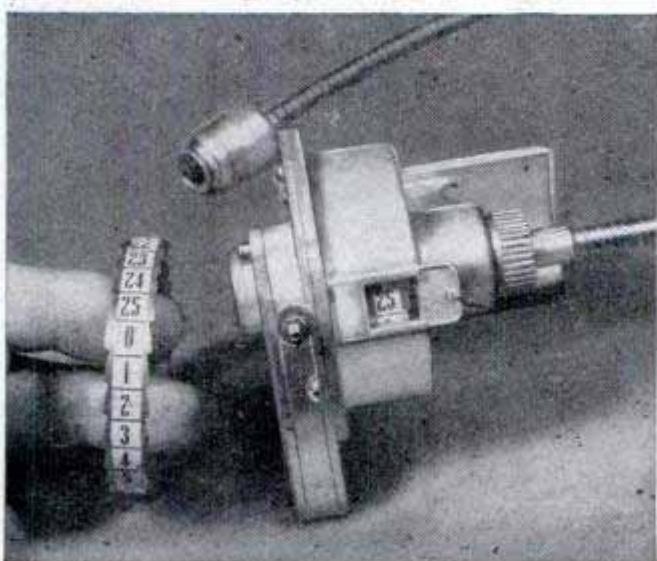
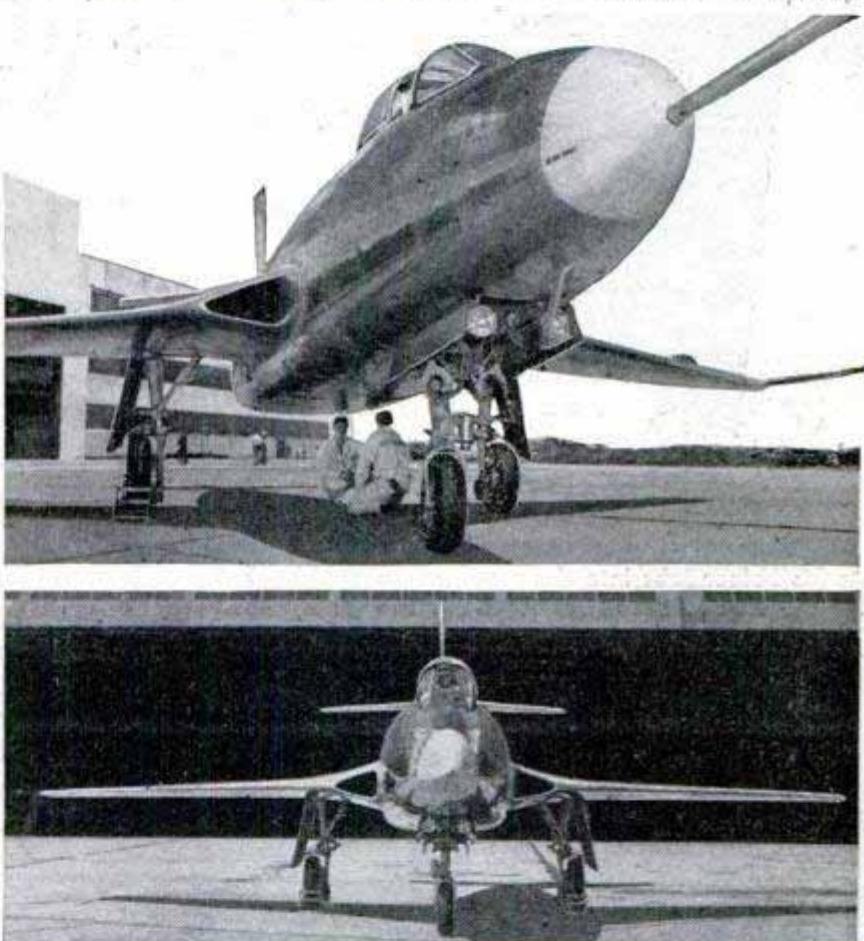


McDonnell Aircraft photos

World's Fastest Plane?

Attempts to exceed the world air-speed record of 670.981 miles an hour with the McDonnell XF-88 Voodoo are expected soon. They will probably be made at the Muroc, Calif., flight test center, where a North American F-86 Sabre set the present mark in 1948. Powered by two turbojet engines, the shark-bellied Voodoo is capable of operating deep in enemy territory. It is about 55 feet long, 15 feet high and has swept-back wings spanning 40 feet. Its cabin is fitted with a power-operated canopy. The Air Force has not yet released performance figures on the XF-88.

Air for the Voodoo's twin turbojets comes in through ducts at the wing roots. The exhaust escapes from an opening below the level of the tail behind the trailing edge of the wing



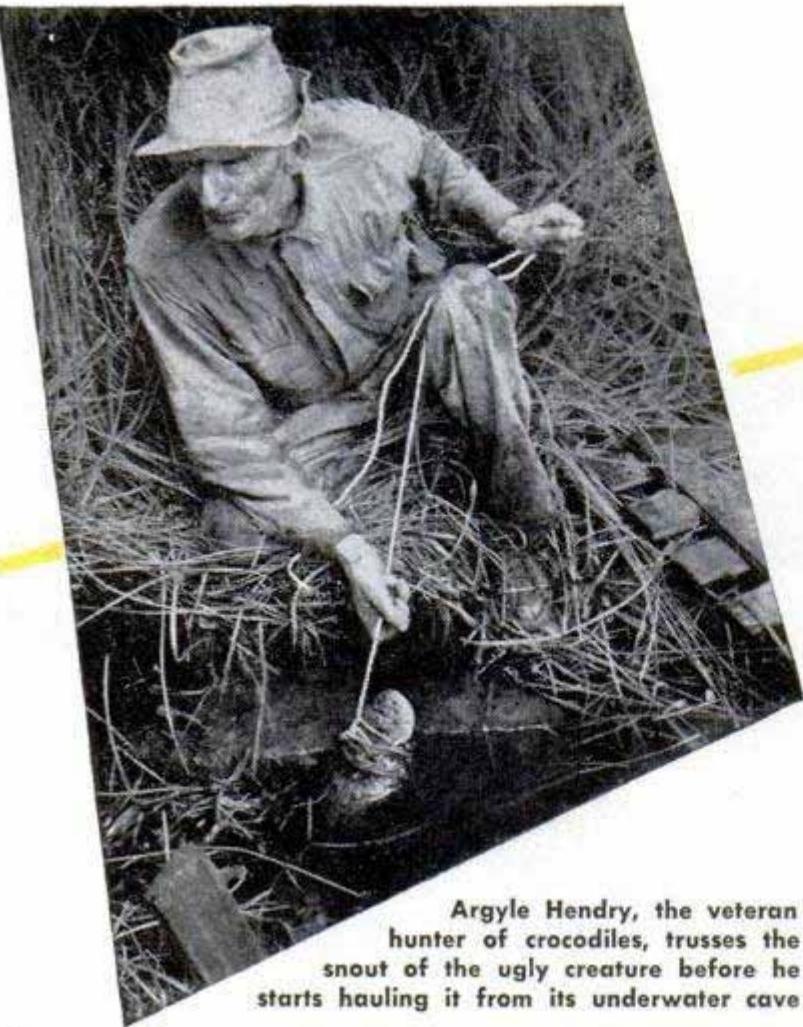
Mechanical "Policeman" Counts Speed Offenses

Car owners who let friends and employees drive their cars can check up on speeding offenses by means of an automatic recorder that counts the number of times the car exceeds a preset speed limit. The recorder is connected to the speedometer cable and a numbered ring, visible through a small window, clocks the offenses. The car owner can set the recorder to operate at any desired speed.

► Fish can be frozen in solid ice for long periods and still survive if they are thawed out gradually.

Crocodile

By
Robert Faherty



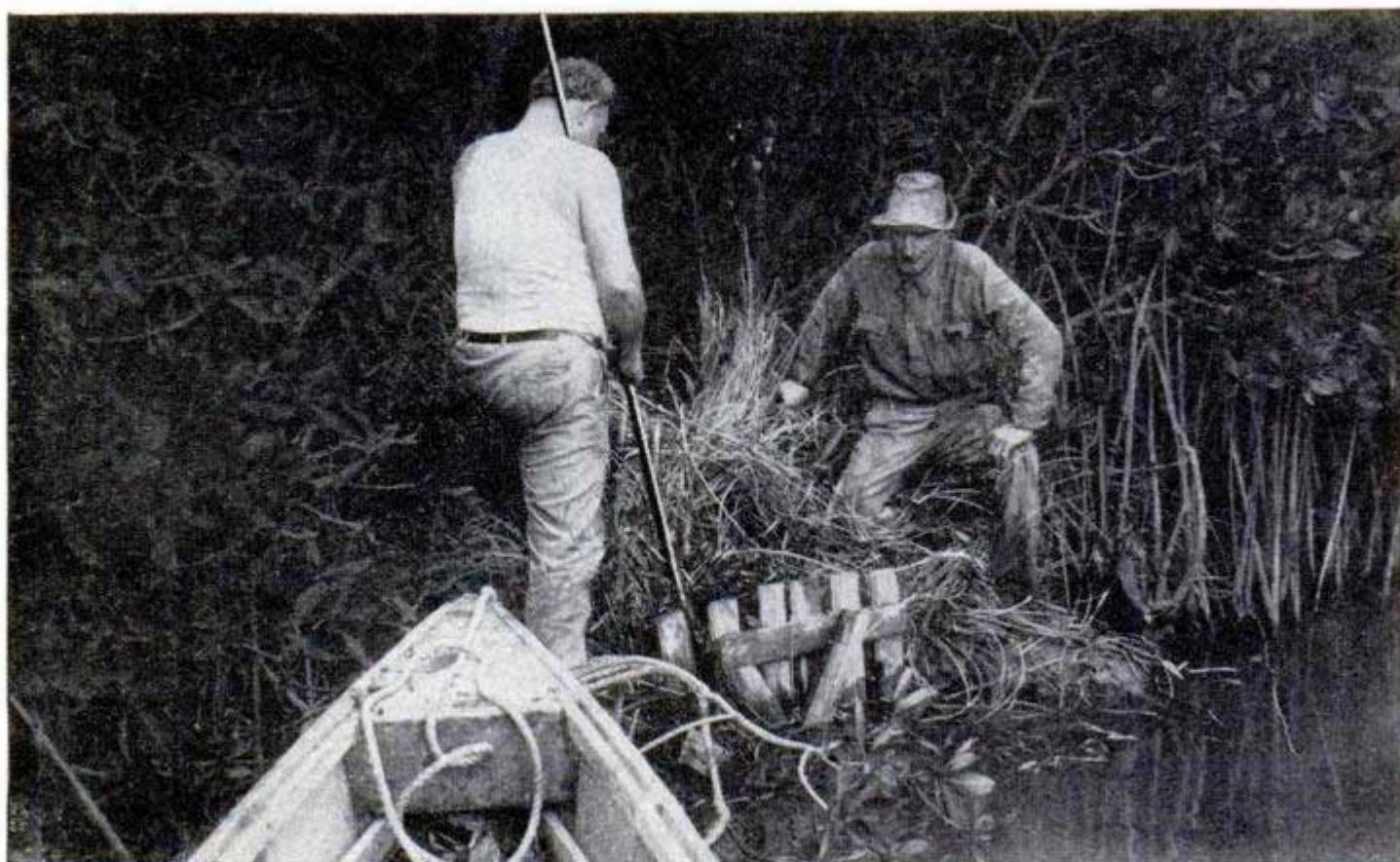
Argyle Hendry, the veteran hunter of crocodiles, trusses the snout of the ugly creature before he starts hauling it from its underwater cave

As his helper jabs into the cave with a gaff hook, Hendry waits for the croc to break for freedom. The gate prevents its escape

CHALLENGING wild crocodiles to a wrestling match in their native swampland may sound like sudden death to most people, but to Argyle Hendry, a Florida hunter, it's a way to make a living.

This lean, grizzled veteran of south Florida wilds brings the jaw-snapping creatures back alive and sells them to reptile farms for as much as \$100 each. His weapons are a spear, some rope, a gaff hook and a basket of tricks. He carries a rifle and shotgun, but they're strictly emergency weapons and he rarely uses them.

From his small boat, Hendry spots the croc as it lies on the bottom of the lagoon. Moving up silently, Hendry hurls his spear



Hunter

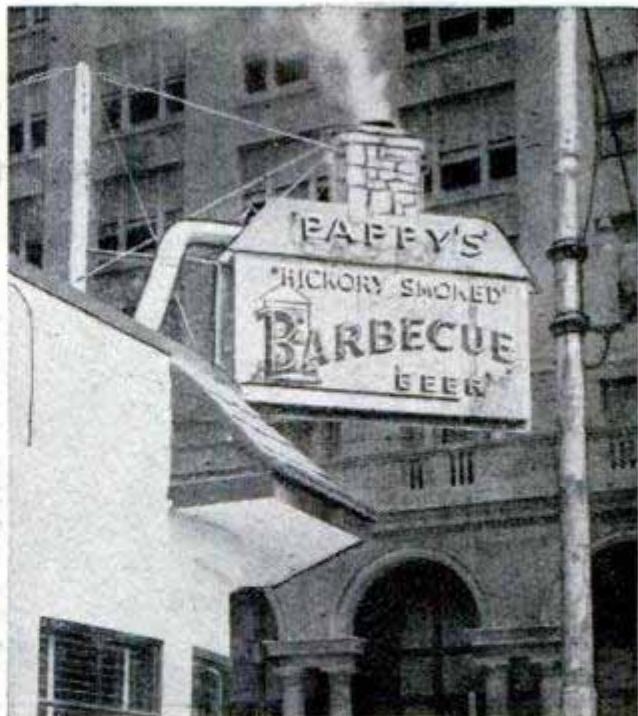
with a tremendous thrust, impaling the animal. If he's lucky, Hendry can hang on as the crocodile twists and leaps, trying to shake itself free. But, as often as not, the powerful brute breaks free and escapes to its underwater cave to nurse its wound.

The next step calls for tricks that Hendry has learned through the years. First, he barricades the cave and jabs into the constricted opening with his gaff hook. Sometimes, the croc, annoyed by the jabs, makes a break for freedom. Then Hendry deftly rings the slender snout with a rope noose and, with his assistant, hauls the thrashing reptile ashore where its powerful tail is tied securely with rope.

Other times, the croc refuses to come out and Hendry has to tempt it to the surface with imitations of the mating call. These deep-throated sounds are something like that of a half-grown swine: "Rooonk, rooonk, oonk, rooooonk."

Once caught, the crocodile is lashed to a pole and brought to civilization where it spends its life basking in the sun, returning the wide-eyed stares of Florida's tourists.

An unwilling subject, the crocodile "poses" for a picture on the dock at Key Largo after the battle

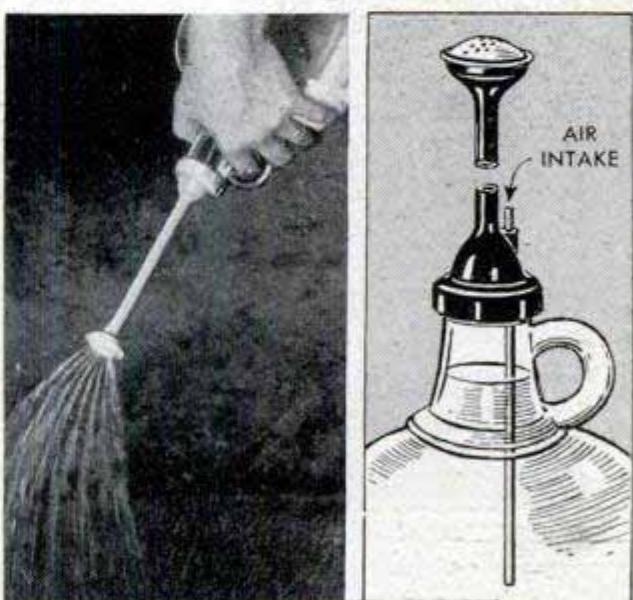


Smoking Sign

"Hickory Smoked Barbecue," read the signs outside a chain of restaurants in Houston, Tex., and passers-by can see and smell the smoke as it rolls from the signboards. Atop the sign is a chimney connected by galvanized pipe with the barbecue pit inside the building. Smoke flowing up through the pipe passes through the chimney and gives an attractive hazy appearance to the neon lights on the display.

Weed-Killer Applicator

Weed-killing solutions are sprayed on lawns by a plastic applicator that requires no pumping or air pressure. The nozzle-like applicator is screwed on the top of a gallon jug containing the solution. When the jug is tilted downward, the solution flows through the nozzle in an even spray.

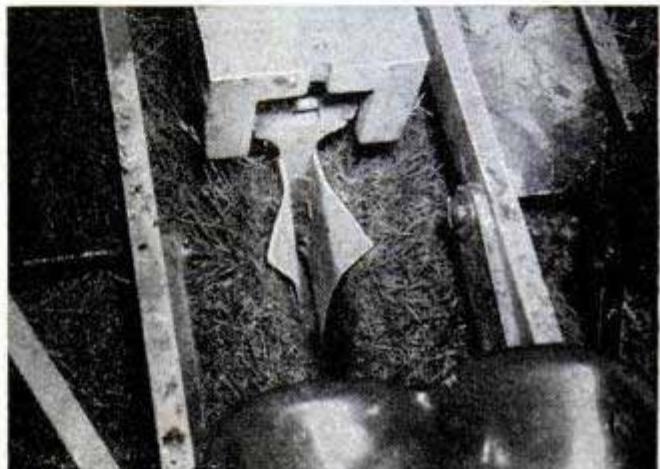




Left, the two rear wheels of the planter pack the soil around the roots of the seedlings. Above, all the operator has to do is drop seedlings into the trench. Below, close-up shows how the trench is cut

Tree Planter

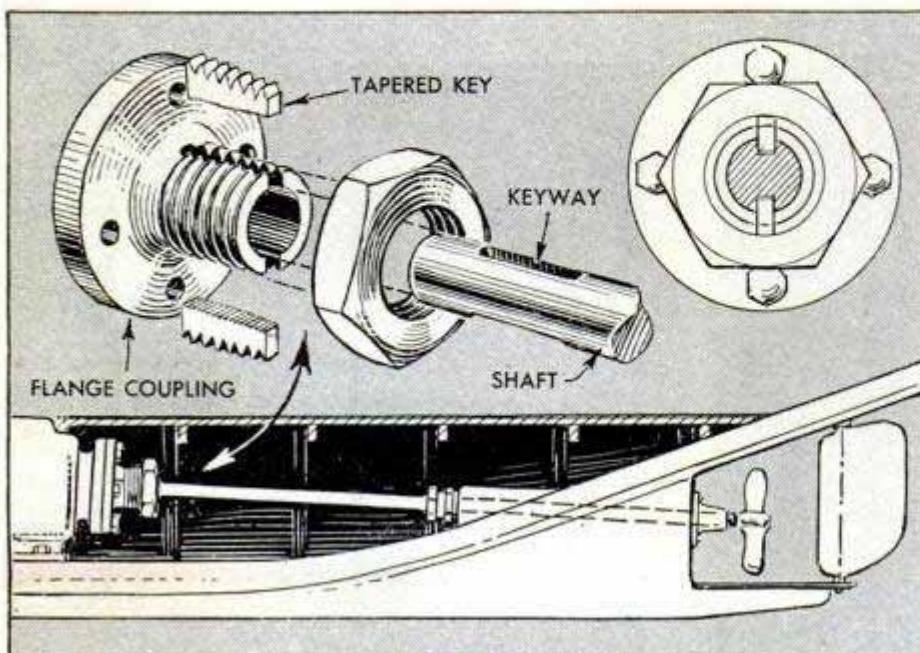
Reforestation is a quick job with a planting machine that plants up to 10,000 seedlings a day. The planter, pulled by a tractor, slips along on steel runners equipped with keels which prevent them from sliding to the side on hills. A coulter makes a slit in the soil and a plow follows to make a furrow. The operator sits behind a tree box that holds 1000 to 2000 seedlings. He drops the trees into the furrow and two heavy wheels pack the soil around them.



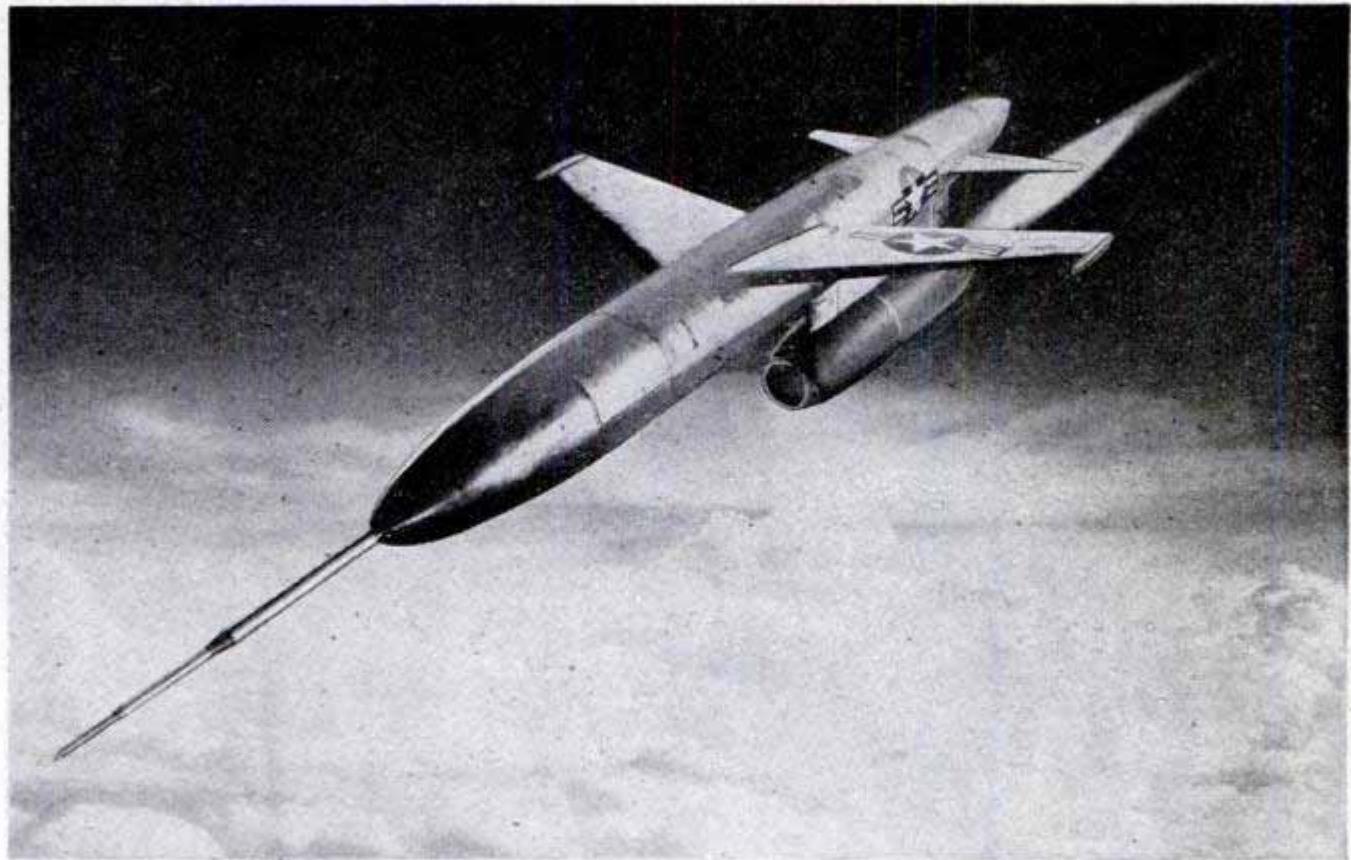
Quick-Change Coupling for Propeller Shaft of Boat

Propeller-shaft connections are made in a few minutes when a new coupling is used. The coupling, designed for attaching the propeller-shaft flange to the propeller shaft of an inboard motorboat, will lock securely

any type of hub, wheel or other connection to a shaft. A self-locking nut eliminates cotter-pinning. Two keys fit into milled keyways and are threaded on the top to match the thread of the hub, which is split to take the keys. For motorboat use, the keyway is not cut through to the shaft end, thus preventing the propeller from backing off when the motor is reversed. The principal feature of the coupling is the speed with which it can be assembled and disassembled, the two operations being completed in a total time of less than 10 minutes.



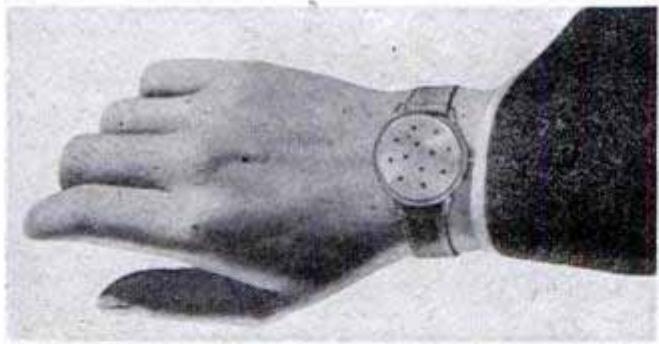
About 12½ billion kilowatt hours of electricity are used each year in the United States in the production of 1¼ billion pounds of aluminum.



Fastest Drone

Maneuvers of the faster fighter airplanes will be simulated by a remotely controlled ramjet target drone being built for the U. S. Navy. The lowest speed at which the KDM-1 can operate is faster than that of any "live" target now being used in anti-

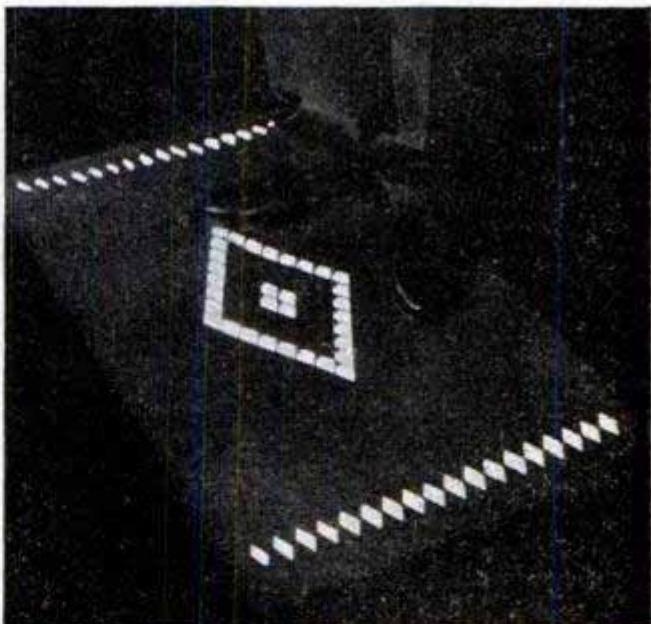
aircraft training. Developed by the Glenn L. Martin Company, the new drone will be launched from twin-engine aircraft preset for a prescribed course or radio controlled in flight. When its fuel supply is exhausted, the drone zooms up, a parachute opens and it drops into the ocean. The drone may be recovered and repaired for further use.



"Wrist Watch" Hearing Aid

As inconspicuous as a watch, a small hearing aid straps to the wrist. The aid is more convenient to use than most types because the wearer need not turn his body toward the speaker to pick up conversation. An almost imperceptible turn of the wrist catches sound coming from any direction. The cord for the hearing aid runs up the speaker's arm under his sleeve.

Samples of air collected by V-2 rockets 42 miles above the earth are the same in chemical make-up as air at ground level, according to scientists at the University of Durham.



Rubber Mat Glows in Dark

Dark stair landings are made less dangerous by a rubber mat that glows in the dark. Treated with a fluorescent solution, the mat outlines the landing to prevent missteps. It is washable and will not chip or crack under ordinary usage.



Back-Yard Ski Tow

Three skiers can ride up a 200-foot slope simultaneously on a back-yard tow built by Dr. H. B. Minnich of Lititz, Pa. Powered by a 3½ horsepower garden tractor, total equipment cost of the tow was less than \$50. The tractor is at the top of a hill, attached to a framework supporting belts and pulleys that transfer power to the car wheel on which the tow rope runs. At the bottom of the incline, the rope passes through a pulley anchored to an upright with block and tackle.



Chemical Makes Cotton and Rayon Fabrics Flame-Retardant

Cotton and rayon fabrics can be made flame-retardant with a chemical which does not change the appearance or feel of the materials, according to DuPont chemists who developed the process. Dry cleaning, home laundering and weathering do not affect the flame resistance. An inorganic chemical, it reacts chemically with

the cellulosic molecule of fibers rather than merely coating the fiber surface. A flame held to the treated materials will char the fabric at the point of contact, but the flame does not spread. The process of applying the chemical, called Erifon, is so exacting that it can be used only in textile-finishing mills, the chemists say.

Eight million people squeezed into the multistoried metropolis of New York down their astronomical daily fare of fresh milk and oranges and artichokes, burn their colossal quotas of coal and kilowatts with little thought of the miracle that restocks their island daily despite blizzard and transportation tangle and the perennial menace of strikes

By Arthur M. York

NO LESS arresting than New York's sky line is its life line.

The story behind the fact that eight million people sit down to dinner daily and each gets a share from the hundreds of car-loads of food served up for the meal is one that speaks both for the industry of the city's myriad food handlers and for the abiding faith of the diners. Part of the low rumble and throbbing of the city is that of

food coursing in along its main arteries to keep its citizens alive. Tugboats toot as they scurry about the harbor, delivering barge-loads of food. Every midnight there's a honking traffic snarl on narrow Washington Street, where hundreds of trucks jockey to deliver or pick up food within a few hours, so that Mrs. New Yorker will find fresh produce at her neighborhood store come morning.

Apartments buildings tremble in the night as meat, milk or poultry trains grind through a tunnel beneath the city. They are on their way to a small crowded freight yard where land values are so high that possible methods of building skyscrapers above the yards have been considered.

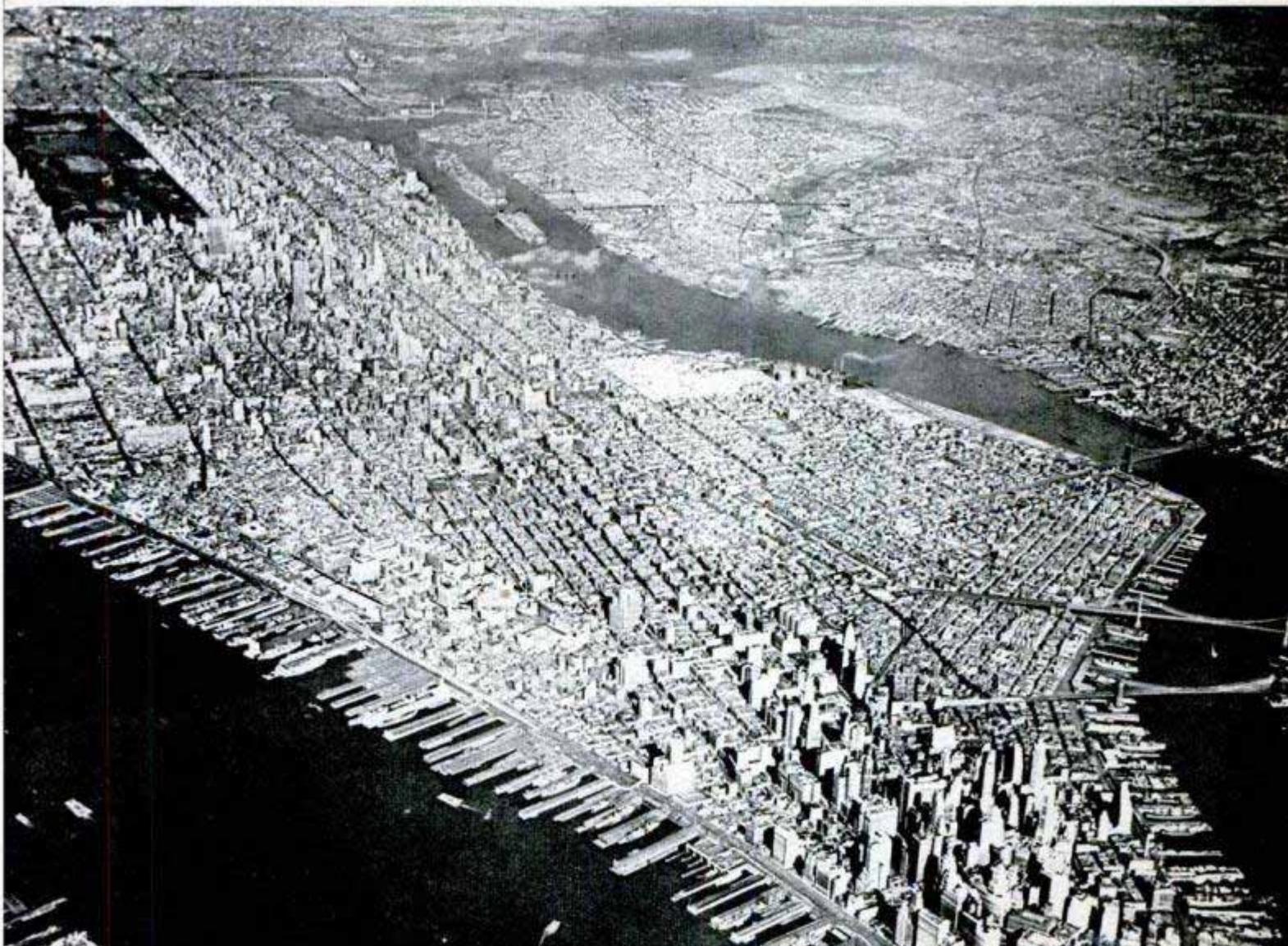
New York has attracted its eight million people because it has everything—everything, that is, except life's necessities.

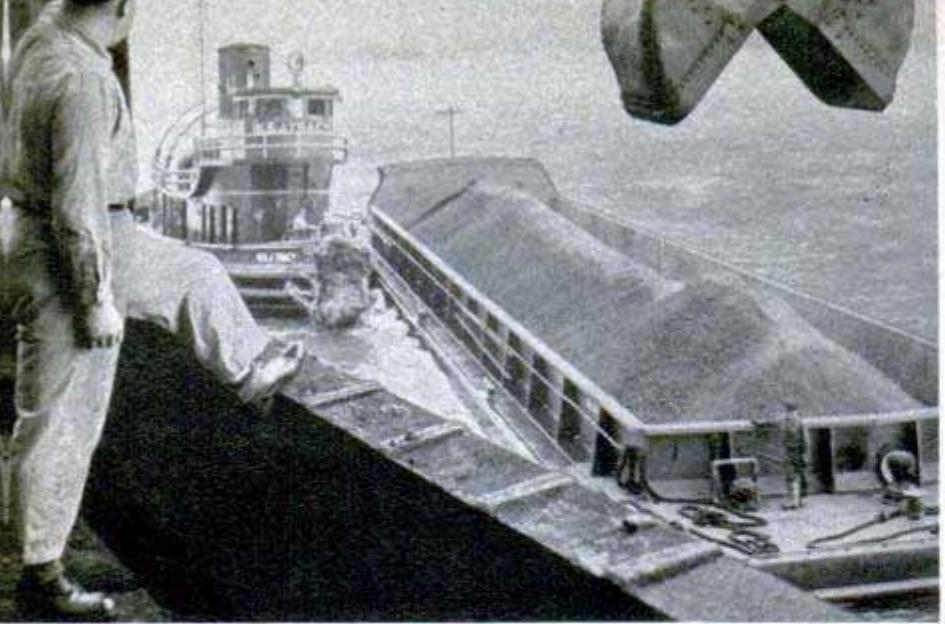
All food and fuel, the very life blood of the city, must be imported. The 1400 car-loads of perishable foods consumed each day come an average distance of 1500 miles.

The 90,000 tons of coal and the 15,000,000

City With a Fragile Life Line

Complicating the problem of supplying New York is the fact that its heart, Manhattan, is a crowded island





Coal barge being nosed into a Brooklyn pierhead. The city's network of power plants alone use 15,000 tons of coal daily



Above, perishable foods are a big part of traffic at the New York Central's freight yards. Below, double-decked piers with truck access to both levels are included in water-front plans

gallons of fuel oil burned daily in New York mean not only heat. They are also power and light. And electric power from fuel-burning steam plants is required for subways, trains, elevators, air conditioning and refrigeration.

Without imported fuel, nothing would move—practically nothing would happen along the city's steel and concrete canyons.

In addition to the 1400 carloads of perishable foods eaten daily in New York, about an equal amount of canned and packaged foods are consumed. Thus, about 2800 carloads, or roughly 28 trainloads, of food must be brought into the city every 24 hours. That's at the rate of a carload every 16 seconds, around the clock.

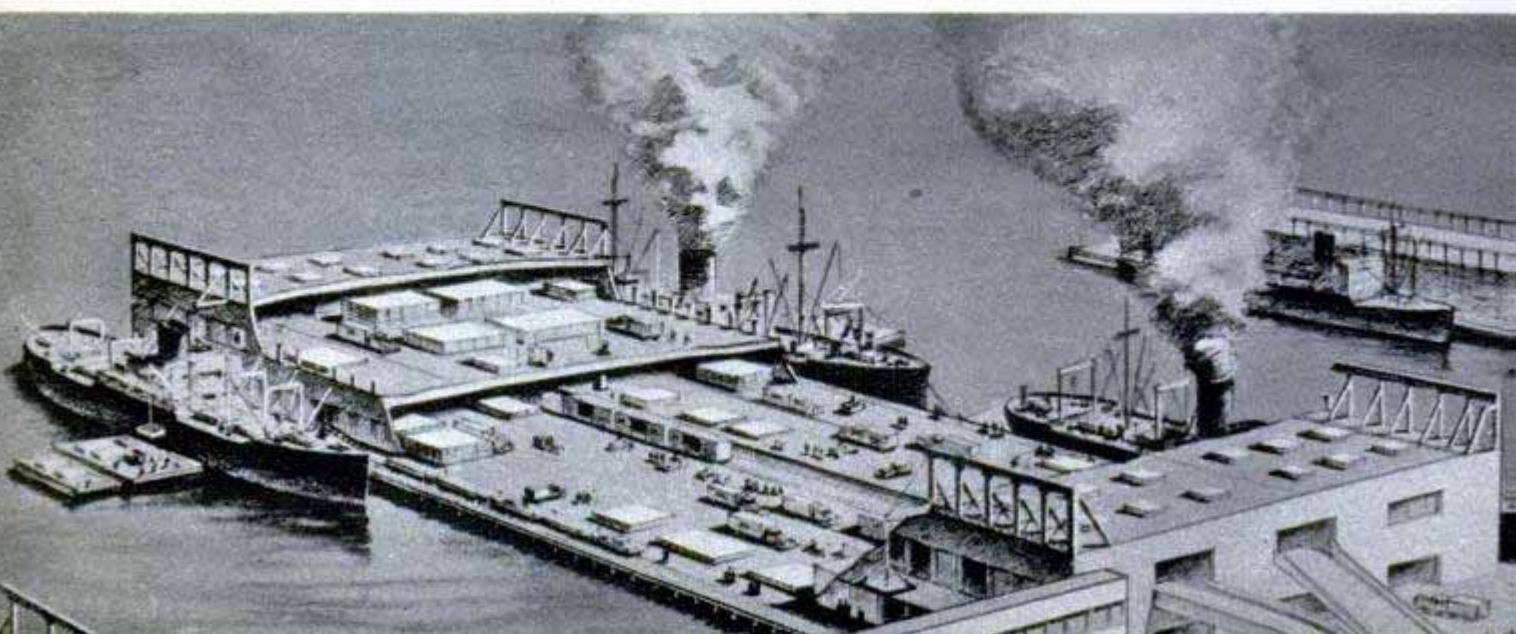
If these big figures defy comprehension, here are a few simplified illustrations:

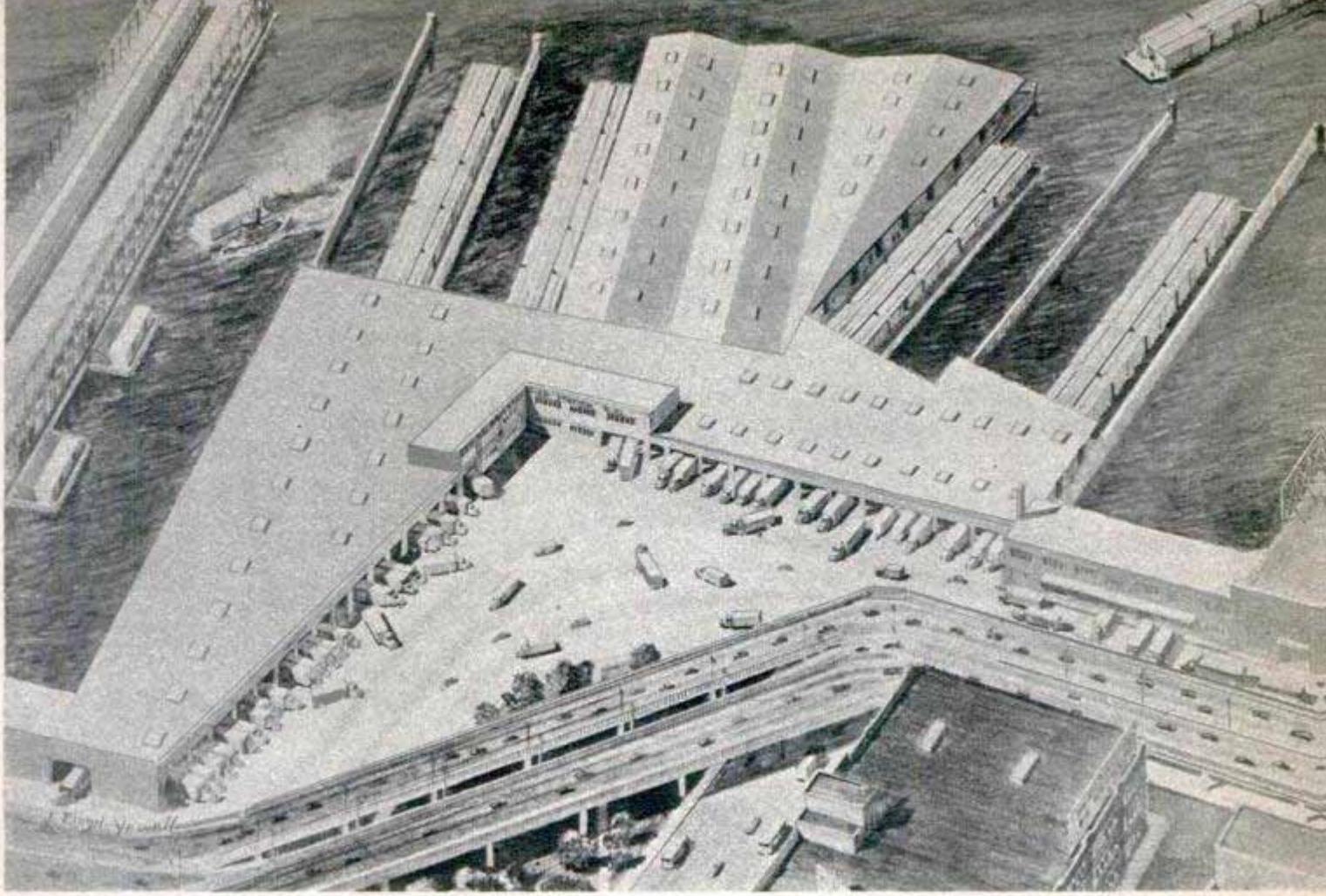
Take an average eight-room house and fill it with eggs. Fill every available space, including the cellar and the attic. That's about 320,000 eggs, enough to keep New Yorkers satisfied for one hour.

These eight million people toss off 30 gallons of milk per second and two dozen 1000-pound beef critters wouldn't last 10 minutes. They eat 2½ carloads of fruit and vegetables every hour.

The fact that the borough of Manhattan, the heart of the city, is an island complicates the problem of supplying New York. It explains why this ultramodern metropolis, serviced by planes, electric trains and trailer trucks, leans heavily on the lowly tugboat.

All of the coal and most of the food comes from the west and must cross the Hudson River. Available





Berthing space for eight car floats is proposed for station along Hudson River, at 23rd Street, in Manhattan

train tunnels are barely sufficient to accommodate passenger and mail trains. Coal is unloaded into barges in New Jersey and towed across the river by tugs to docks in Manhattan, Brooklyn and Queens. About two thirds of the perishable foods come by the same route.

Fuel oil is delivered almost entirely by tanker ships from the Gulf of Mexico. These ships, as well as those bringing in tropical foods, require the help of tugboats to jockey them into position at the docks.

Thus, the 400 tugboats in New York har-

bor constitute a vital link in the life line.

Trucks also play a big part. Produce trucks roll in from farming areas in New York and New Jersey, with 60 percent of the city's fresh fruits and vegetables. And today, tank trucks are giving overworked rail lines into the city a lift by toting in 65 percent of the 5,000,000 quarts of milk New Yorkers thirst for daily.

Trucks also shuttle most foods from railheads and dockside to markets and corner grocery stores throughout the city, and deliver coal and fuel oil to homes.

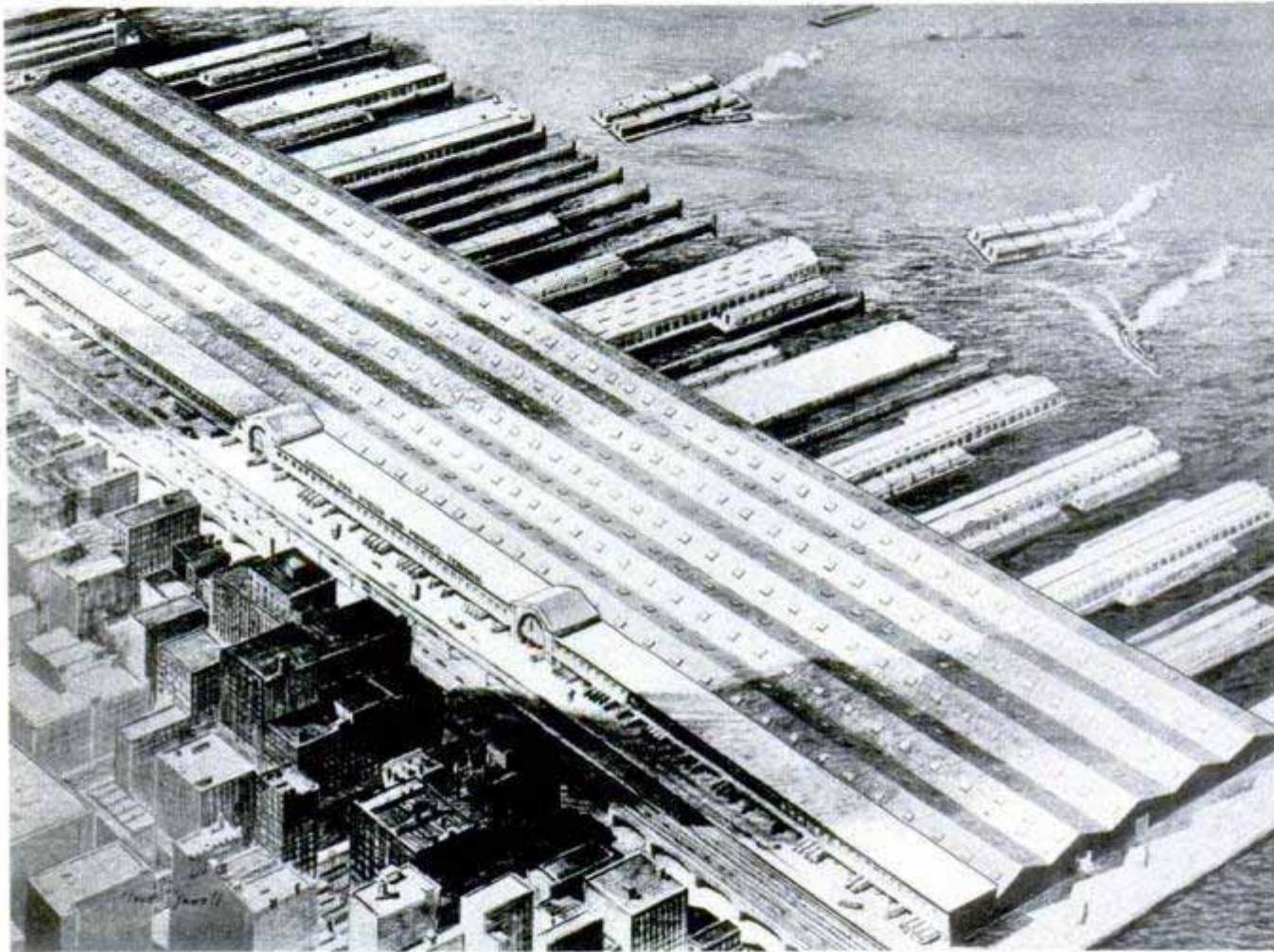
Sliding tank, with a fraction of city's five-million-quarts-a-day milk quota, from flatcar to truck trailer



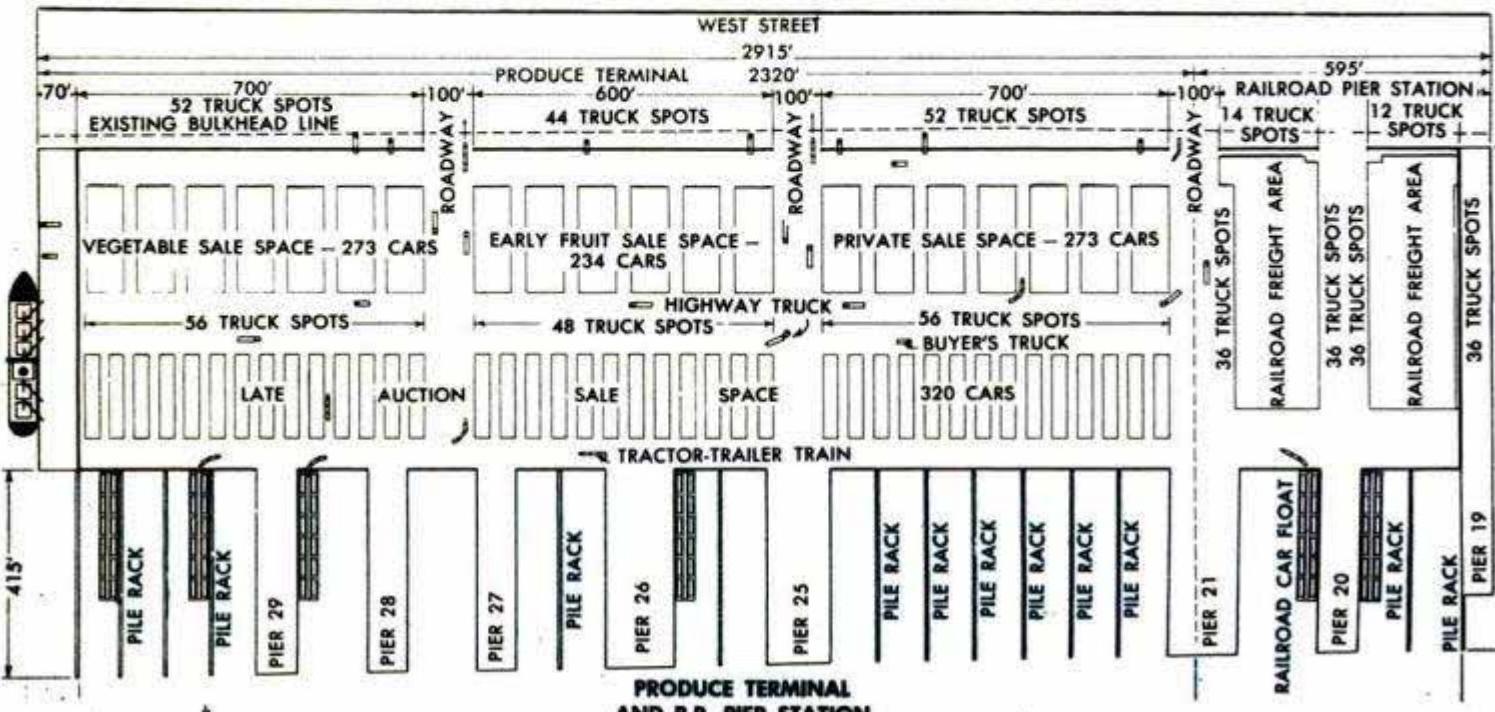
With these many complicated and interdependent lines of food and fuel delivery, interlacing the city like a blood system, it seems almost miraculous that it goes on day after day, on and on, without somewhere breaking down. Nothing, it seems, can stop it. One would think that a transportation strike or a heavy snow would quickly snarl the tight schedule, leave store shelves and coalbins bare and make thousands go hungry and cold.

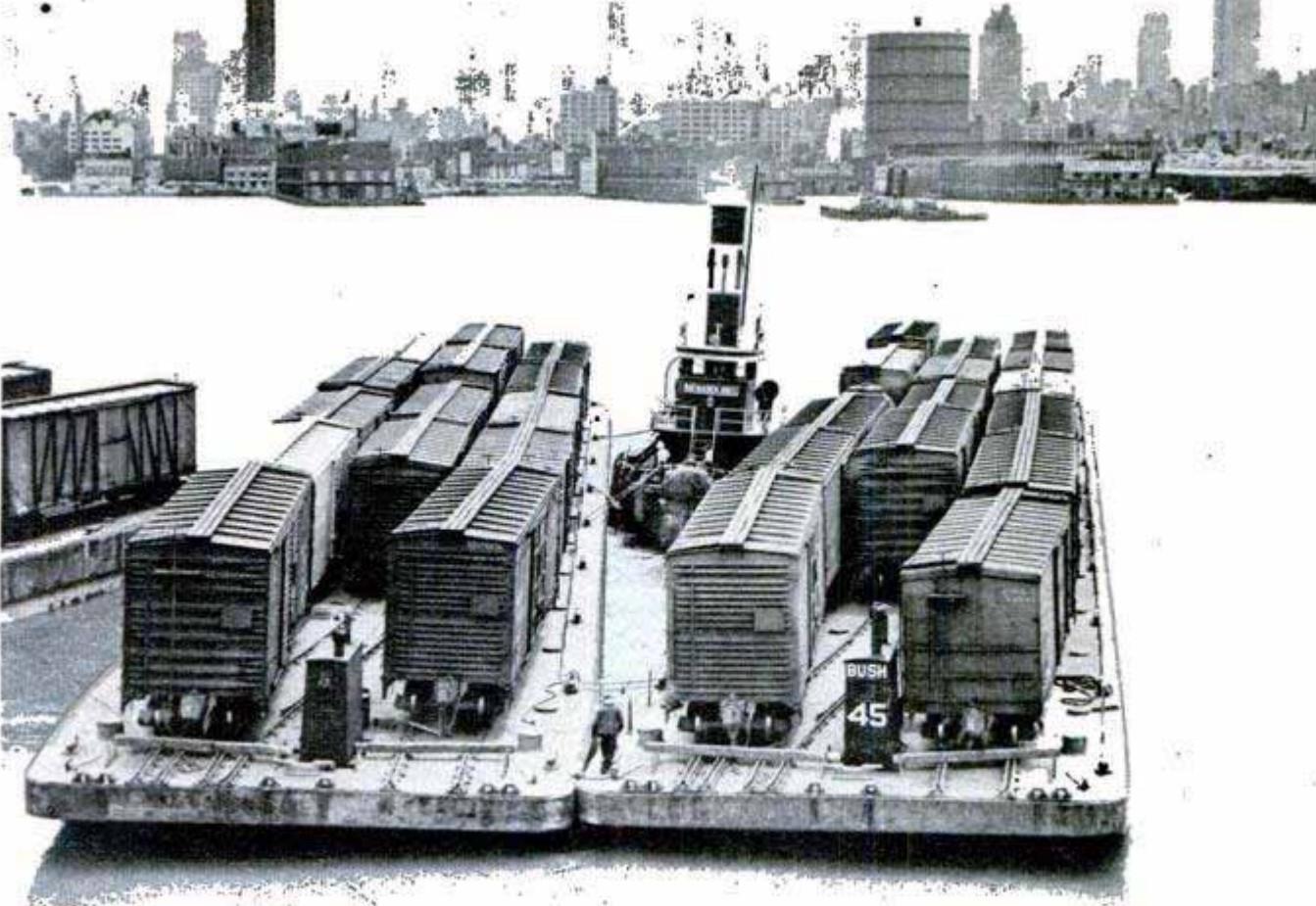
But not so. New York has faced every kind of hunger threat—tugboat strike, rail strike, truck strike, blizzard—and rode serenely through with no more than slight inconvenience.

Perhaps the answer is in the city's diversification of food deliveries. If one mode of transport is stopped, the others tend to take up the slack. Also, the city carries a considerable backlog of food in pantries, stores, warehouses and cold-storage plants.



Approximately 1,200,000 tons of fresh fruit and vegetables will be distributed yearly to New Yorkers from world's largest produce terminal, to be built on Hudson River. Diagram below shows arrangement of facilities





The railroad strike of May, 1946, was hailed at the time as a greater threat than coal, tugboat and steel strikes combined. However, when the strike ended after a 10-day duration, the city had not yet used up its food backlog. Meanwhile, the city police and market departments had made arrangements to mobilize 5000 trucks to bring in 15,500 tons of fresh produce a day from farms within a radius of 100 miles of the city. Over 100,000 trucks in the state could have been pressed into service if necessary.

The tugboat strike of September, 1946, also worried the city momentarily. But the strikers continued to carry essential supplies. Even if they had not, it would have been possible to shuttle food supplies across the Hudson by truck.

A truck tie-up could be the greatest blow of all. No other form of transport can substitute for the trucks that deliver food to stores or fuel to homes.

Witness the September, 1946, strike of truck drivers. Within a week, chain-store shelves were bare. These stores closed their doors until the strike ended, weeks later. However, the strike involved only chain-store food deliveries. Police escorted non-striking truckers as they made deliveries to independent grocers. New York's eight million eaters were slightly inconvenienced, but suffered no hardship.

The biggest snowstorm in the city's history—the 26-inch fall in December, 1947—made hardly a dent in the city's supply of essentials. Milk was in short supply for a few days, due to stalled tank trucks. And

All of the coal and most of the food for Manhattan must cross the Hudson River, keeping a fleet of 400 tugboats busy pushing barge traffic. Below, shifting canned goods to trucks for distribution to stores



home fuel deliveries were hampered for a day or two, until side streets were cleared of snow. But snow-removal crews gave priority to the movement of essential commodities and New Yorkers went on eating.

Neither man nor nature has been able to brew a catastrophe sufficient to throttle the big city's throbbing life line.

In fact, city officials are more concerned over the gradual stifling effects of time. Every increase in population (it has mounted half a million in the last 10 years) places

an added strain on already overworked dock facilities, produce markets, traffic lanes and freight yards.

New York's food-supply system is becoming both more precarious and more expensive. Dock facilities are limited and crowded and trucks backing up to them block street traffic.

By an inefficient but unavoidable system, a large portion of produce brought across the river on car floats is trucked to the Washington Street market, to be unloaded, auctioned and loaded onto other trucks. As



Above, new construction is expected to eliminate two thirds of the trucking in and out of the congested Washington Street Market. Below, a 26-inch snow in 1947 hampered but didn't halt New York's supply of essentials

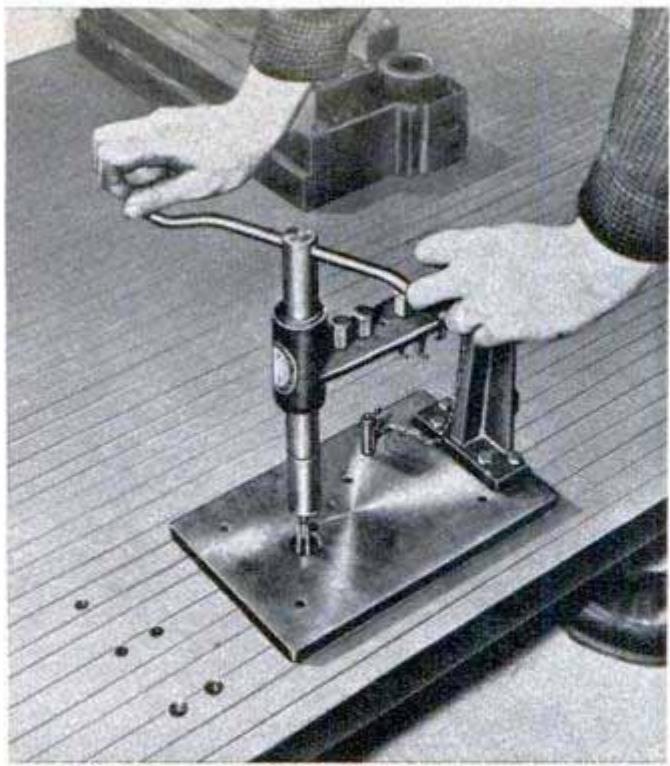
a result, the market area in rush hours often contains three times as many vehicles as it can conveniently handle. The congestion spells delays, overtime expense for handlers and truckers and added expense to the food consumer.

The city is studying means of cutting and mounting cost of food deliveries. According to one plan, \$7,225,000 could be saved in vessel delays each year by building new piers and widening and improving the ones that already exist.

Construction of a new fruit and produce terminal—the world's largest—is also being considered. Because of high real-estate costs in the area, it is proposed to construct this terminal entirely over water, extending for 12 blocks along the water front. Under a single 32-acre roof, over 1000 carloads of produce (about half a million separate packages) can be unloaded from car floats, displayed, sorted, sold and delivered to 434 buyers' truck berths within a few hours.

This project would relieve traffic congestion on water-front streets and eliminate two thirds of the trucking in and out of the overburdened Washington Street market area. It would reduce by nine million dollars the annual cost of the city's fruit and vegetable deliveries. And it would remove a cause for concern, about which the average bustling New Yorker has never a second's thought anyway.





Guide Cuts Tap Breakage

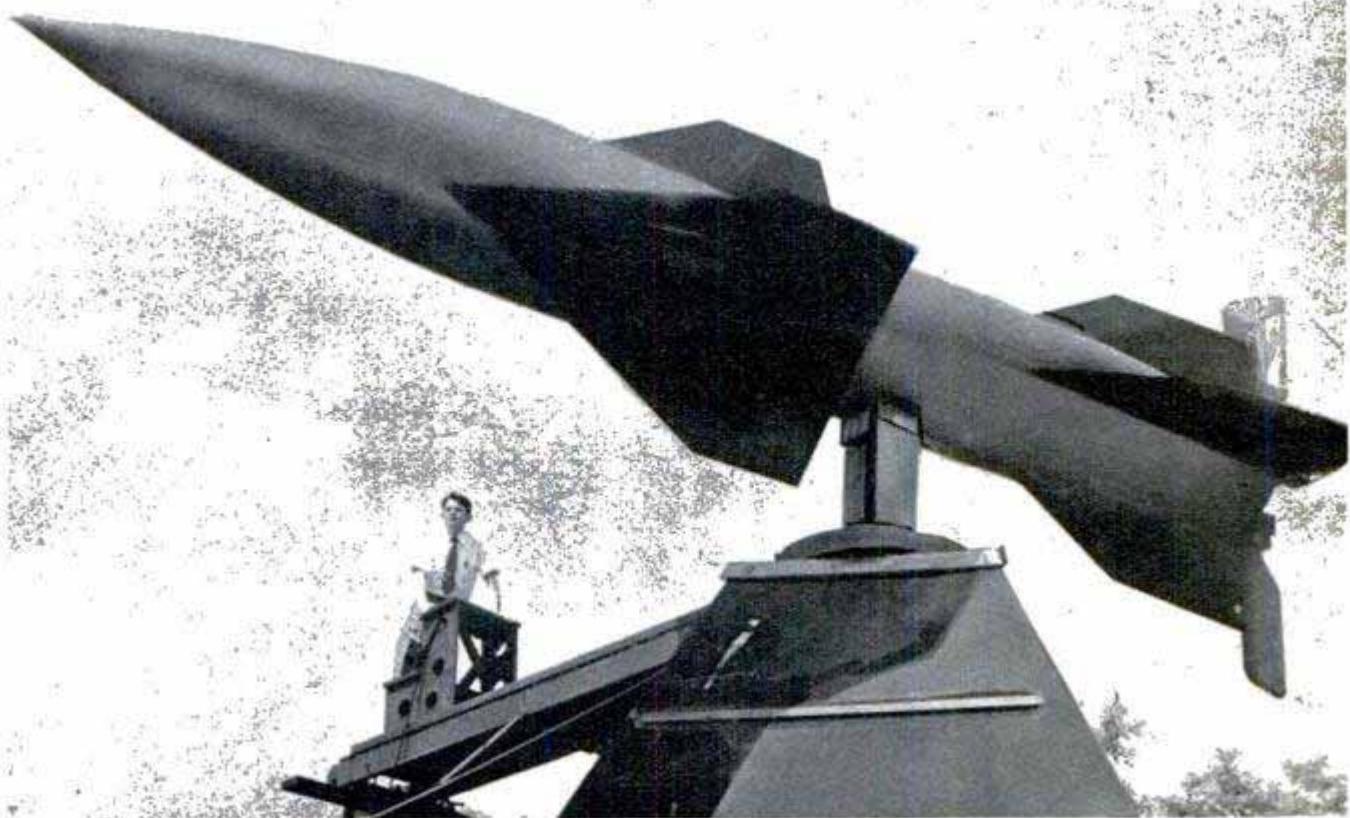
Tap breakage is virtually eliminated by a portable guide that keeps the tap running straight in the hole. Suitable for lathe and hand tapping, the guide comes equipped with seven adapters for all normal requirements. If desired, the spindle can be removed and used alone as a tap extension for hard-to-reach jobs. The complete unit weighs about 32 pounds.



"Stick Ons" for Children

Colored cutout designs for children's play are made from flexible Vinylite plastic that sticks to polished surfaces or a special game board. They are pressed in place with the fingers and no glue or paste is needed. The shiny, nontearing designs are easily removed and can be reused indefinitely. All parts of the set can be cleaned with a damp cloth.

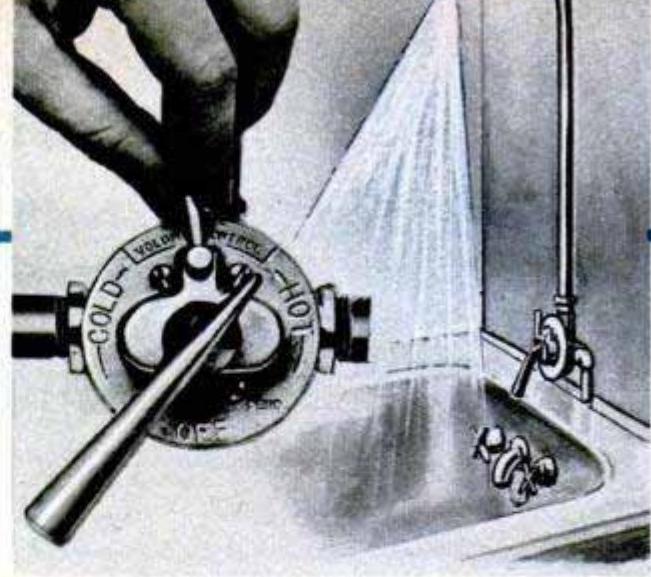
FLIGHTLESS ROCKET is not really a rocket at all, except in appearance. It's a wooden scale model that, like the extinct dodo, never leaves the ground. Built by General Electric engineers as part of their research program for the Army, the model furnishes data for use in designing rockets that will zoom skyward



WHAT'S NEW For Your Home



ELECTRIC BROILER holds meat upright in a steel grill. With it, you can broil food right on the table



VOLUME CONTROL on shower-mixing valve lets you adjust temperature and flow separately. Full flow or trickle, the water temperature remains the same



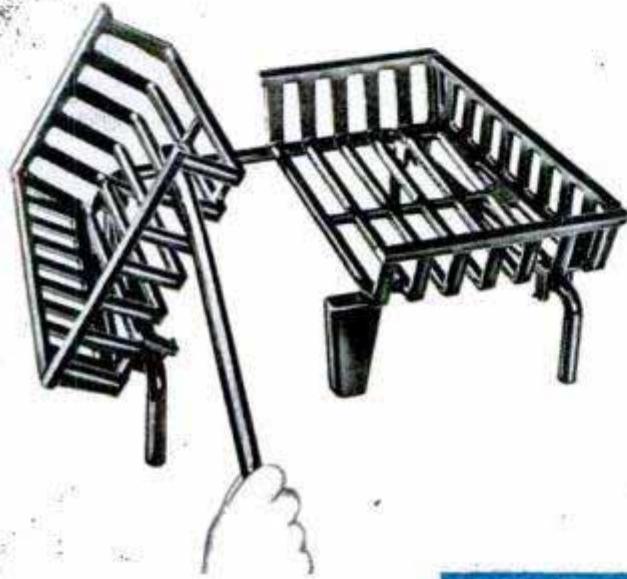
CLOTHESLINE FASTENER eliminates knots and can't slip. The heavier the load, the tighter the grip

BASEBOARD HEATER, below, can be installed in existing homes right over the present baseboard





INSIDE-OUT CLOSET is designed like a section of a revolving door. The entire outer wall swings inside, bringing the clothes rack into the room for convenient selection of clothing. Built as a unit, it can be installed in a standard clothes closet or, if desired, set against a wall as a separate piece of furniture

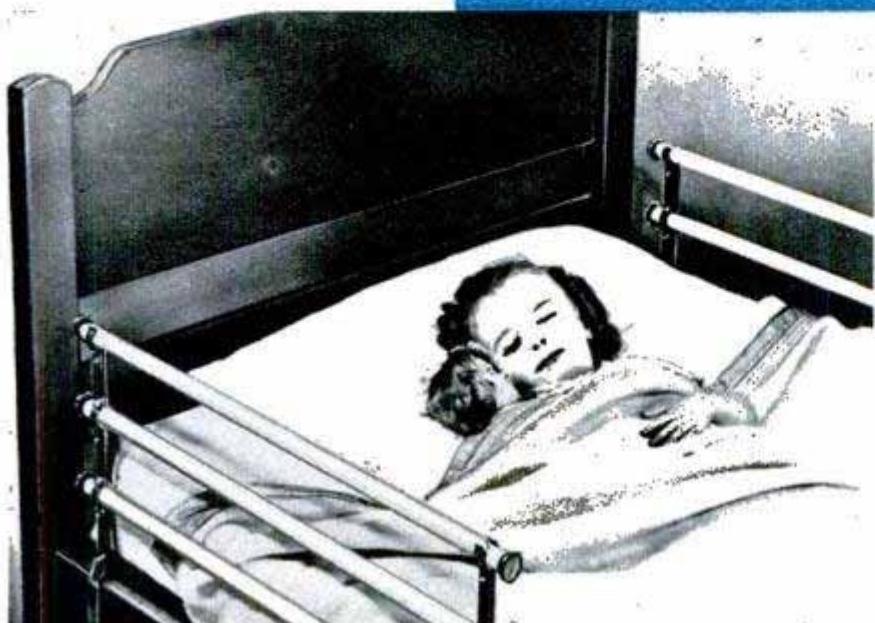


DIVIDED GRATE for fireplace swings up, uncovering the center of the hearth for quick cleaning

SAFETY GUARDS, below, coated with Tenite plastic, clamp to bed so sleeping child can't roll off

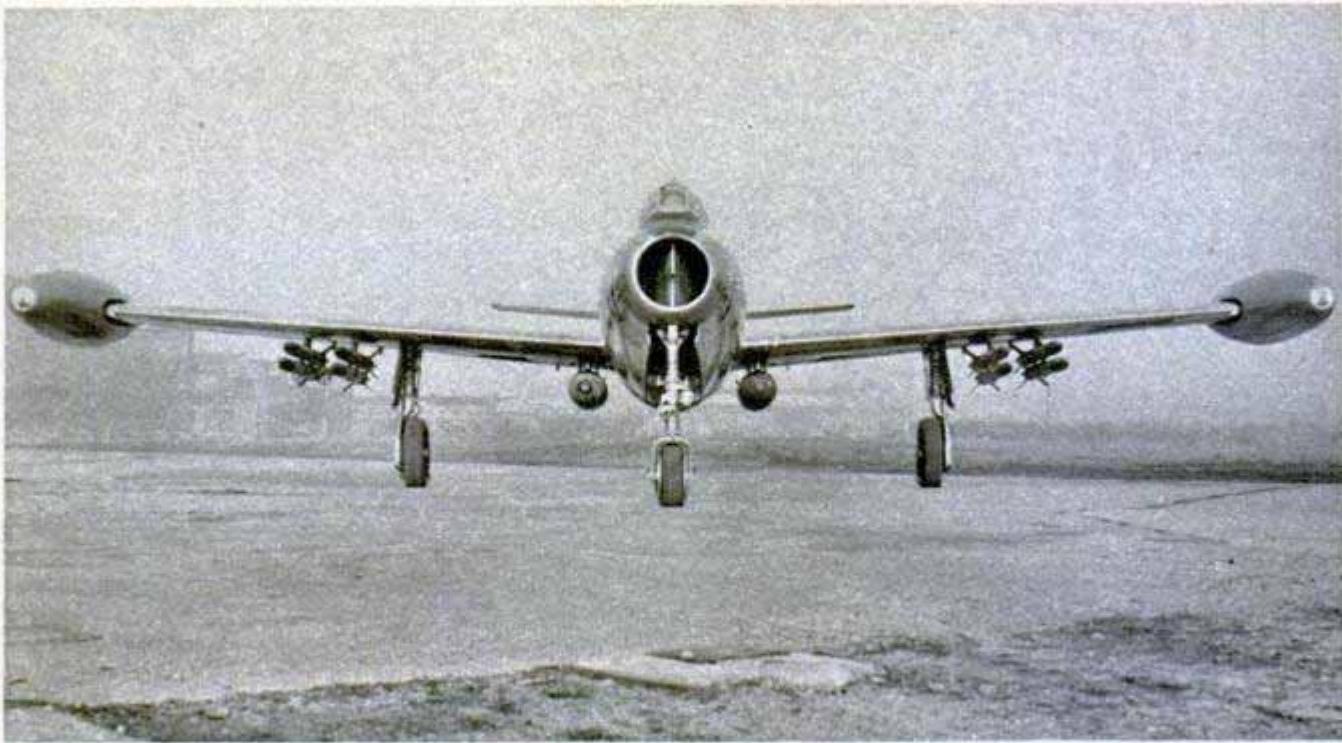


ALUMINUM AWNING comes in kit form. Sketch, left, shows how louvers keep sun out, let light in



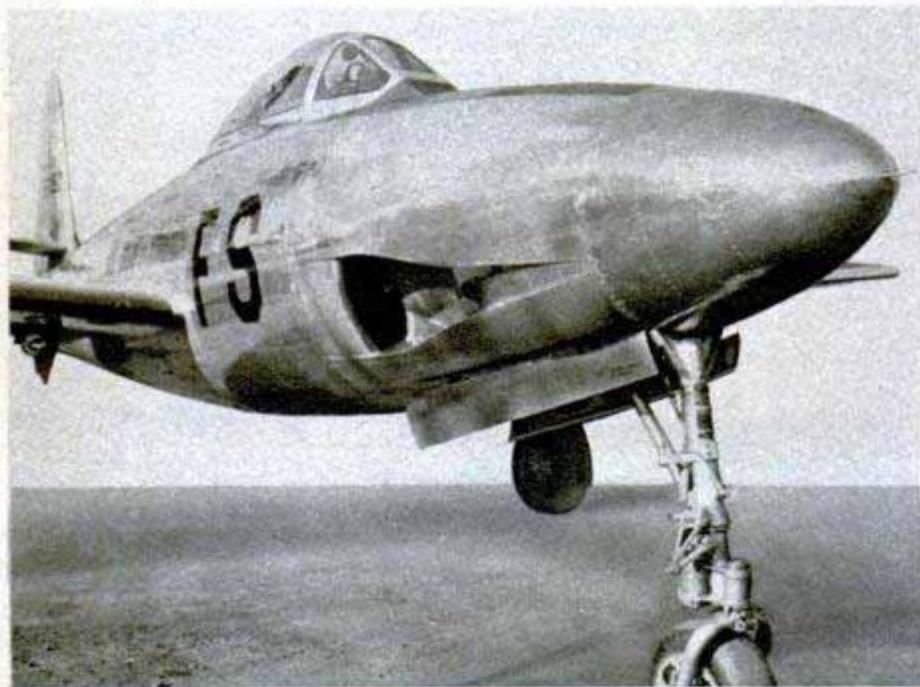
ELECTRIC DRIER has built-in warm-air breeze; makes its own "sunshine" by ultraviolet lamp





Republic Aviation Corp. photos

Above, a rocket-and-bomb-laden F-84, before nose air intake was plugged.
Below, the plane after nose "operation," with new flush side inlet ducts



Front-Line Transport For U.S. Air Force

Something new — air lift from staging areas to the front line — will be supplied by the Northrop Raider C-125 assault transport. Full-span flaps and high wing lift permit the three-engine cargo plane to operate from dirt runways. A rear ramp door allows trucks to be driven directly aboard. The U. S. Air Force is getting 13 for assault transport use and 10 for arctic rescue work. The Raider requires only a two-man crew for routine



operation, is 65 feet long, has an 87-foot wingspan and carries a five-ton pay load. It has a rugged, fixed landing gear with long-travel shock struts to soften rough terrain landings.

Thunderjet Fighter Gets "Radar Nose"

To improve its ability to detect enemy bombers, the F-84 Thunderjet's "breathing" nose has been experimentally replaced by radar equipment. Air for the engine will enter through flush side inlet ducts. The change has increased the plane's rate of climb. A new version of the F-84, already in production, will have a 50 percent greater range and 5000 foot greater ceiling than the model now used by the Air Force. The nose section was lengthened to allow the pilot more room.

"Elastic" Roofing →

Asphalt roofs last years longer when coated with a metallic compound that protects the asphalt from the weather and, at the same time, increases the waterproofing and insulating qualities of the roof. Not to be confused with liquid aluminum asphalt paints, the new material is completely mineral hydrocarbon plus pure aluminum paste. It is non-oxidizing and will not lose its toughness, elasticity, reflectivity or adhesion. The material is so elastic it can be stretched like rubber. Prepared in liquid form, it is applied by spray, brush or mop. The solvent evaporates, leaving a bright, uniform foil film bonded to the cured asphalt surface.

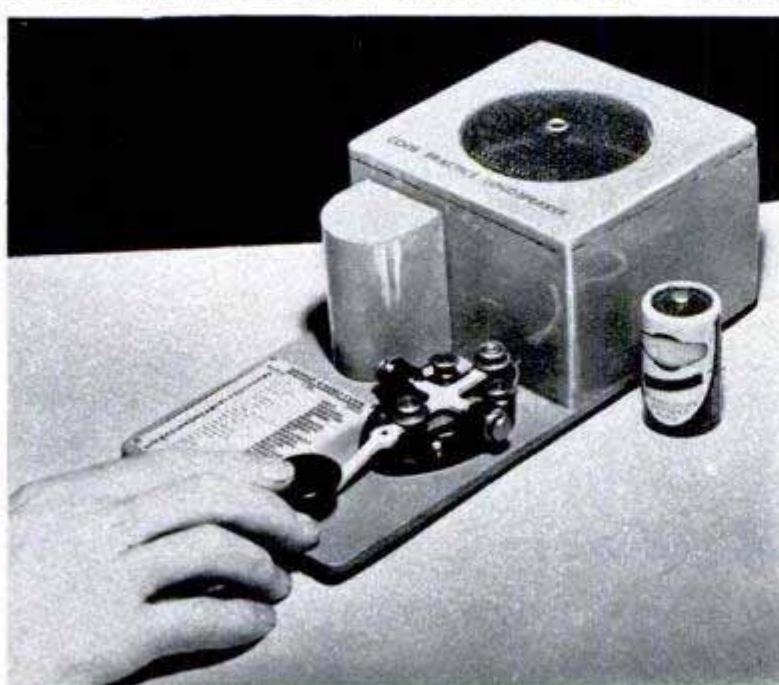


"Cooked" Crystals Last Indefinitely

Quartz crystals, used by radio stations to keep their broadcasts on an assigned frequency, can now be made virtually everlasting with a process discovered by Army Signal Corps scientists. The crystals are superheated to about 900 degrees and then gradually cooled. Ordinary crystals deteriorate and fail to keep the broadcast signal on the cor-



rect frequency. This aging characteristic is eliminated by the new crystals, which will hold a desired frequency indefinitely.

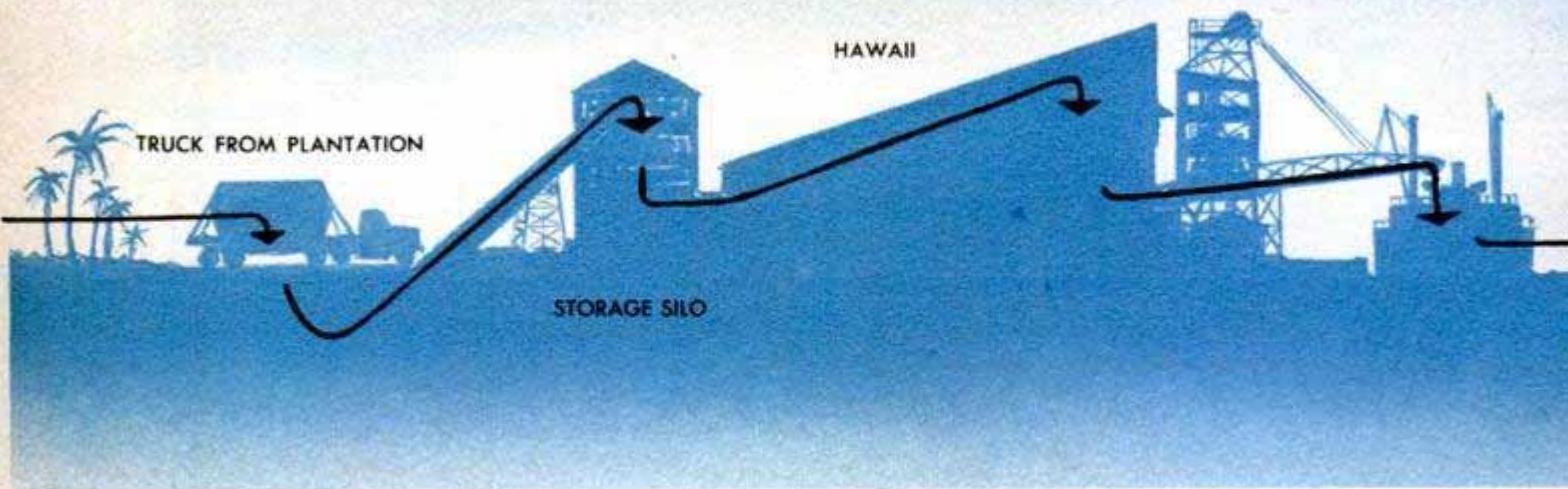


Telegraphy Practice Set Works on Flashlight Cell

Only a small flashlight cell is needed to power a new telegraphic code-practice set that uses no vacuum tubes. It has a four-inch speaker and for long-distance operation external terminals are included. Six sets can operate on one line. The unit produces a tone and volume comparable to professional sets.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, available from Bureau of Information, 200 E. Ontario St., Chicago

Belt Line to the Sugar Bowl



MILES of endless belts and scores of giant silos may soon replace the lines of sweating stevedores, balancing heavy bags of sugar on their shoulders, as the annual crop of sweetness makes its way to American refineries.

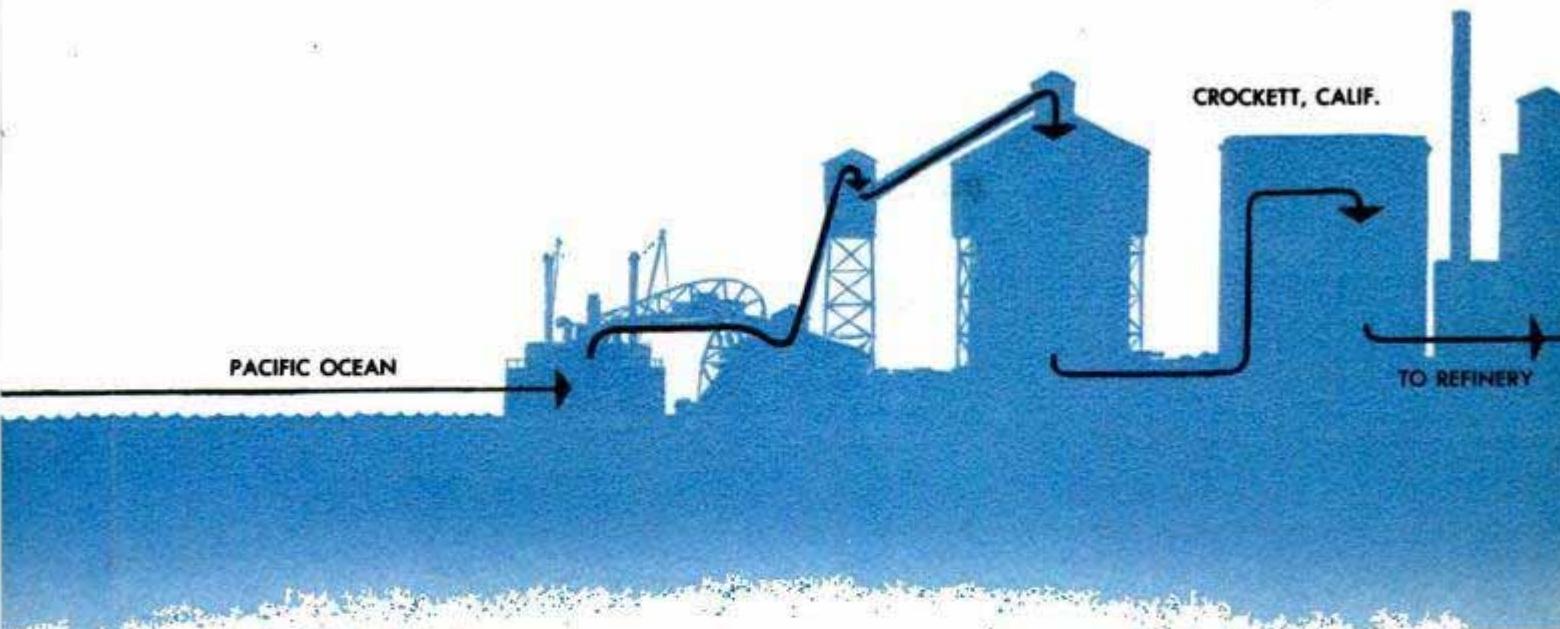
Hawaiian growers have solved the problem of bulk-handling raw sugar and, at

present, about half of the islands' million-ton crop is shipped to California refineries in bulk. With the Hawaiian-California installation as a pattern, sugar men all over the world may soon use belt lines to "pour" raw sweet into the world's sugar bowls.

Costly and frequently scarce jute sugar bags will be unnecessary; handling costs

Clamshell bucket at Crockett, Calif., bites into the raw sugar before dropping it into center discharge tube





will be reduced; turn-around time of ships will be cut and there will be better use of cargo space, when the promising Hawaiian techniques are universally adopted.

Cement, grain and other loose products have long been carried on and off ships by belts and blowers, but special problems connected with raw sugar, principally its stickiness and tendency to pack under pressure, have made ordinary bulk methods unfeasible. When the war began in 1939, the sugar men, faced with the threat of an end to jute-bag shipments from India, decided to work on the problem with all their energies.

The Hawaiian industry was the first. By 1942, a 30,000-ton-capacity bulk sugar storage plant had been erected at the port of Kahului on the Island of Maui, within sight of cold-eyed young marines practicing beach-storming operations which soon were to be followed by victories over the Japanese on the Pacific Islands.

Simultaneously, preparations were made at Crockett, Calif., to unload and store the raw sugar. Two steel gantries were erected at the dock and equipped with continuous-chain bucket elevators, which could be lowered into the steamer holds to remove the sugar.

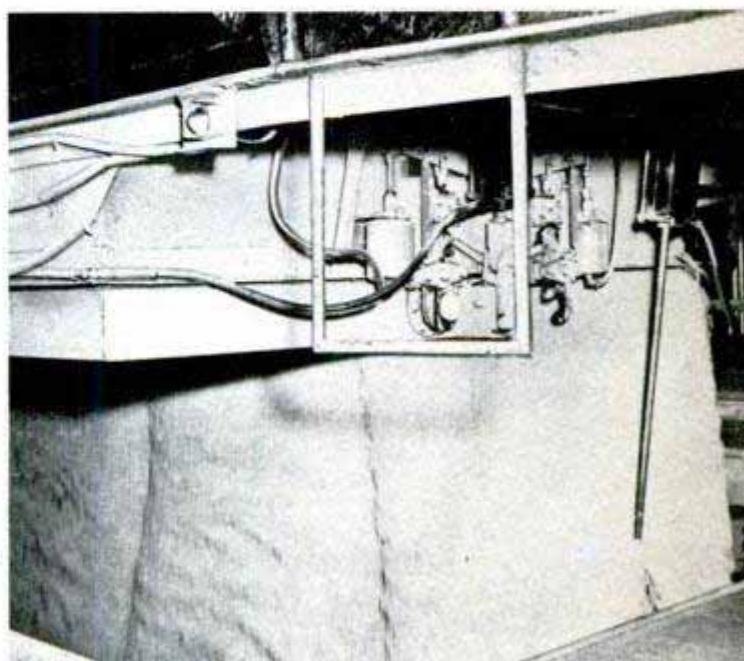
The first shipment from Hawaii was made in June, 1942, and the method proved entirely practical. Further expansion to other Hawaiian ports was postponed until 1947, due to material shortages.

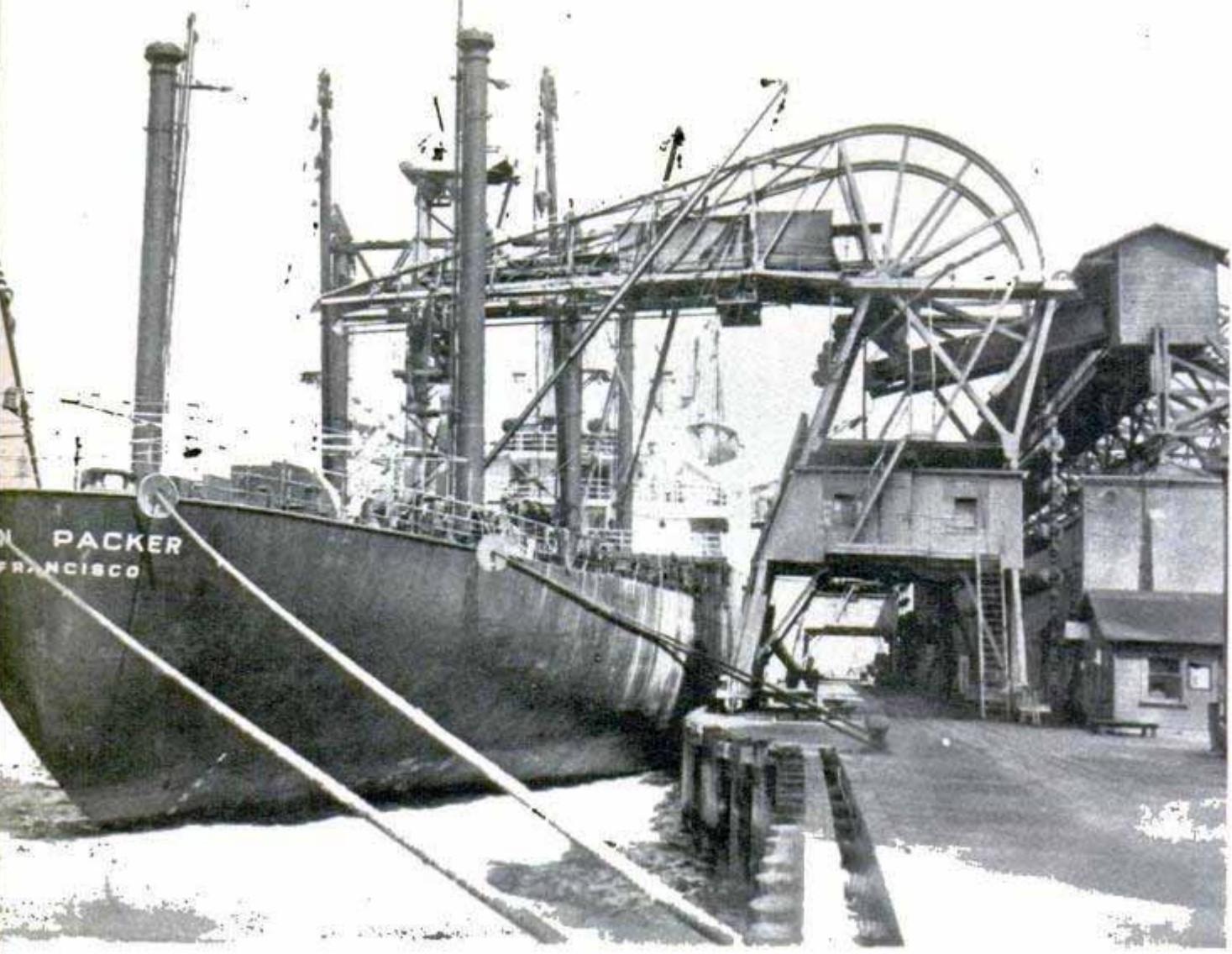
The Maui operation accounts for about 15 percent of the Hawaiian crop. Next facilities were started two years ago at Hilo, on the "big" Island of Hawaii, where another 30 percent of the crop is grown, and the Crockett facilities were enlarged.

Thirty thousand tons of sugar can be stored at Maui and 40,000 tons at Hilo. The former is a large wooden structure, while at Hilo there are four steel silos, 76 feet in



Trailer, filled with 20 tons of raw sugar, has its load weighed on a scale before dumping it at Hilo bulk plant. Below, the glistening raw sugar pours from trailer into the receiving pit on way to silo





Bulk sugar by the shipload is unloaded mechanically from this C-3 cargo vessel alongside the Crockett dock

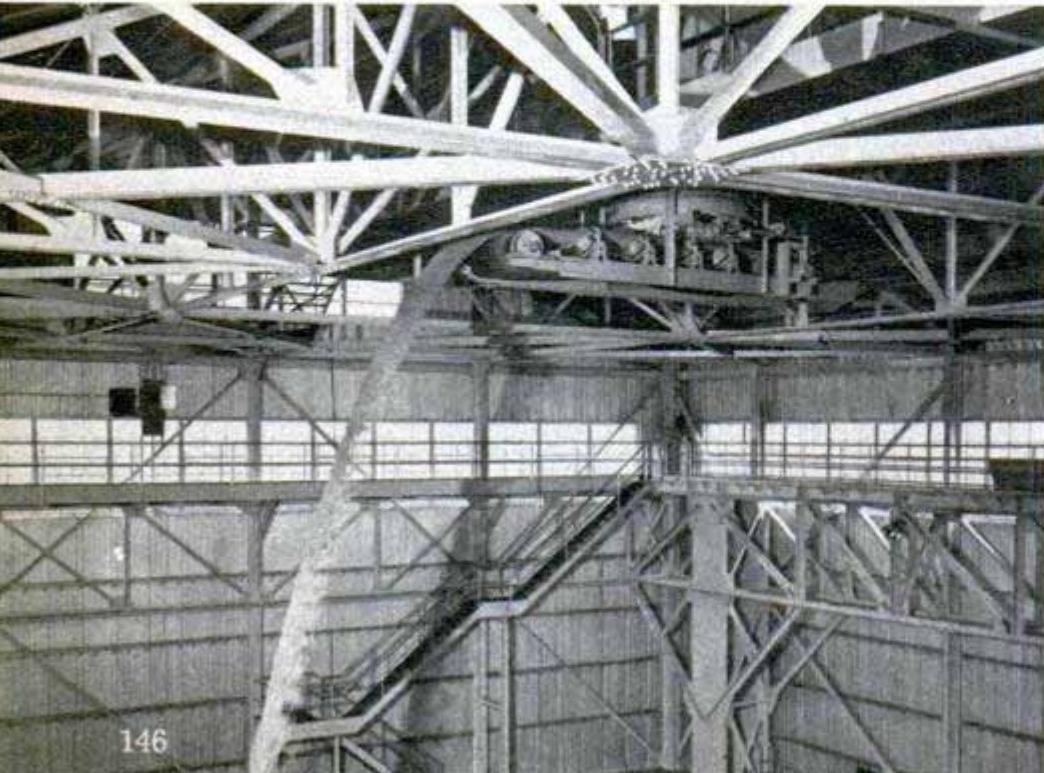
height and 80 feet in diameter. Later, at Nawiliwili on the Island of Kauai and Honolulu, Oahu, construction will follow the Hilo design.

Sugar is dumped by rail cars or trucks directly on long conveyor belts, which carry the sugar to the top of the silos, where it

pours, like a waterfall, into the bins below. Covering the silos is a superstructure that houses moving cranes, from which are suspended the clamshell buckets used to discharge the sugar. These pick up the sugar in the silos and drop it down a sectional discharge tube that extends up through the center of each silo. At the bases are conveyors which carry it to the steamers. The discharge tubes are made up of six-foot lengths of steel pipe, six feet in diameter, which are added section by section as the sugar builds up in the silos. As sugar is removed, tubes are similarly taken down, section by section.

A device known as a Sinden trimmer "shoots" the sugar to all sections of the steamers' holds.

Like a shimmering waterfall, the raw sugar cascades from a conveyor belt into an 80-foot silo at the Hilo storage plant





These are the storage silos at Crockett, Calif. Note the ramps inside which conveyor belts move the sugar

The two unloading gantries at the dock are arranged to travel the full length of the vessels so that sugar can be removed from any hatch. The Crockett plant, which is a cooperative owned by the Hawaiian plantations under the name California and Hawaiian Sugar Refining Corporation, has nine storage silos to hold the sugar until it can be refined. The total capacity is 90,000 tons.

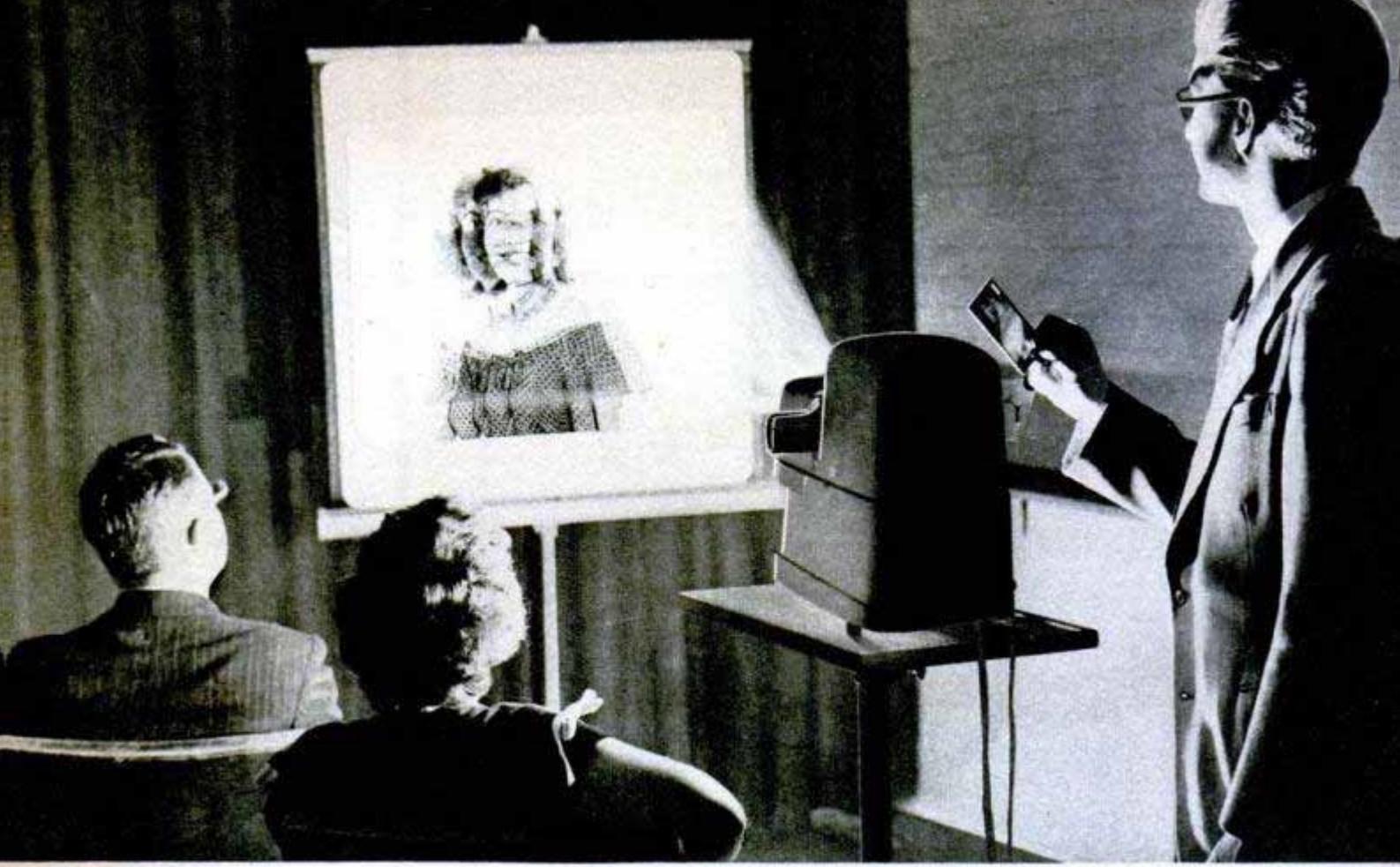
The C-3 cargo vessels now used to haul raw sugar from Hawaii to Crockett have not required any extensive alterations or additions. Solid wooden sheathing is used to keep the sugar away from the hull. Average bulk cargo is 7000 tons, and 10 ships have so far been equipped for the work.

When completed, the

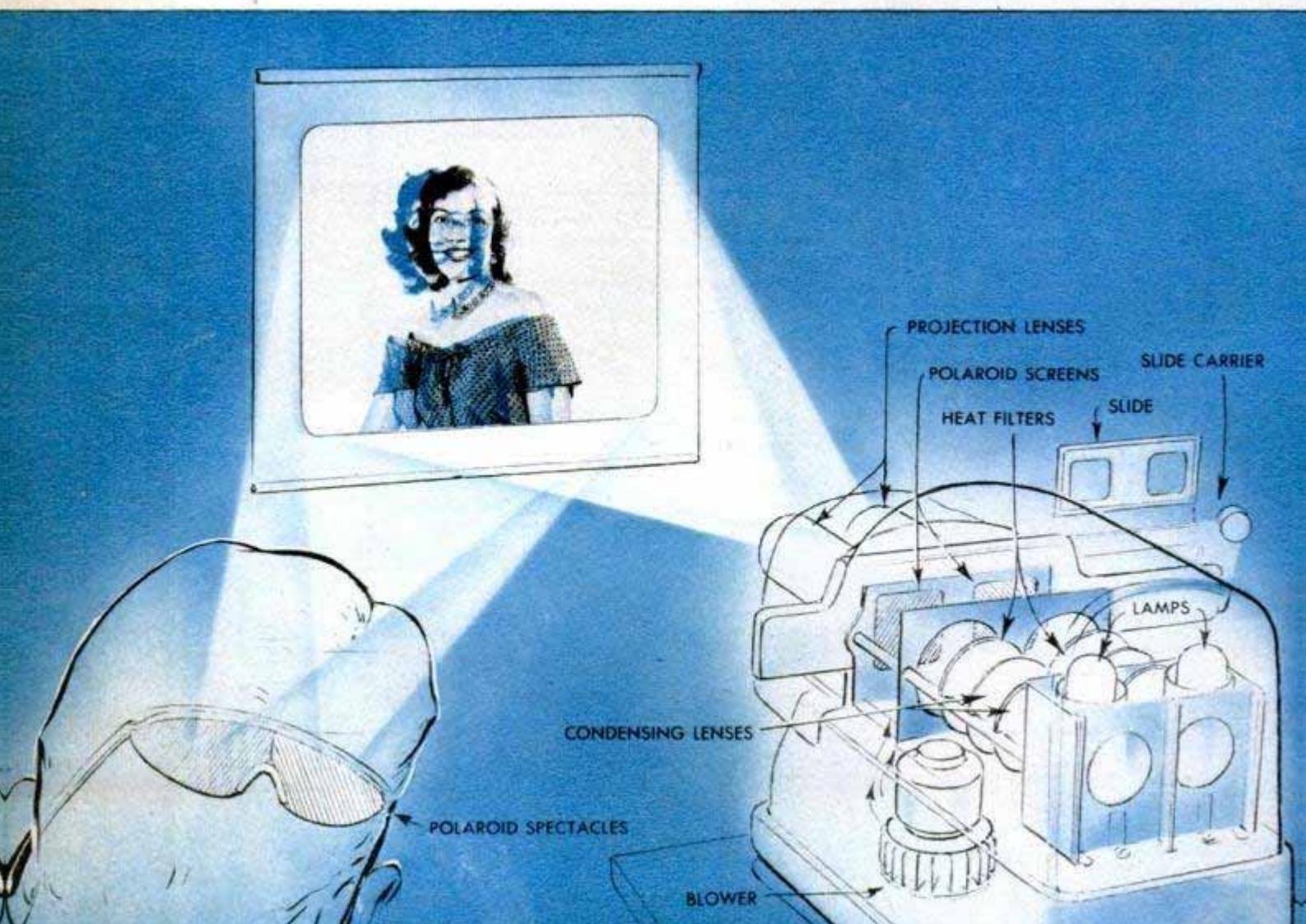
Flowing uphill, the raw sugar is carried to the silos. Hopper at rear is the pit into which the trailer dumps its big load

Hawaiian and California units will have cost about \$9,000,000, borne proportionately by the Hawaiian plantations. For more than a half century, these sugar-growing farms have improved methods of production until today they are among the most progressive farm enterprises on earth.





Above, not much larger than a regular projector, the stereo model shows slides in three dimensions. Below, drawing shows optical system and position of twin images. Two colors are used here to separate images for clarity. Actually, both images would be in full, natural color. Notice the Polaroid screen and spectacles



TWIN LENSES PROJECT COLOR IN THREE DIMENSIONS

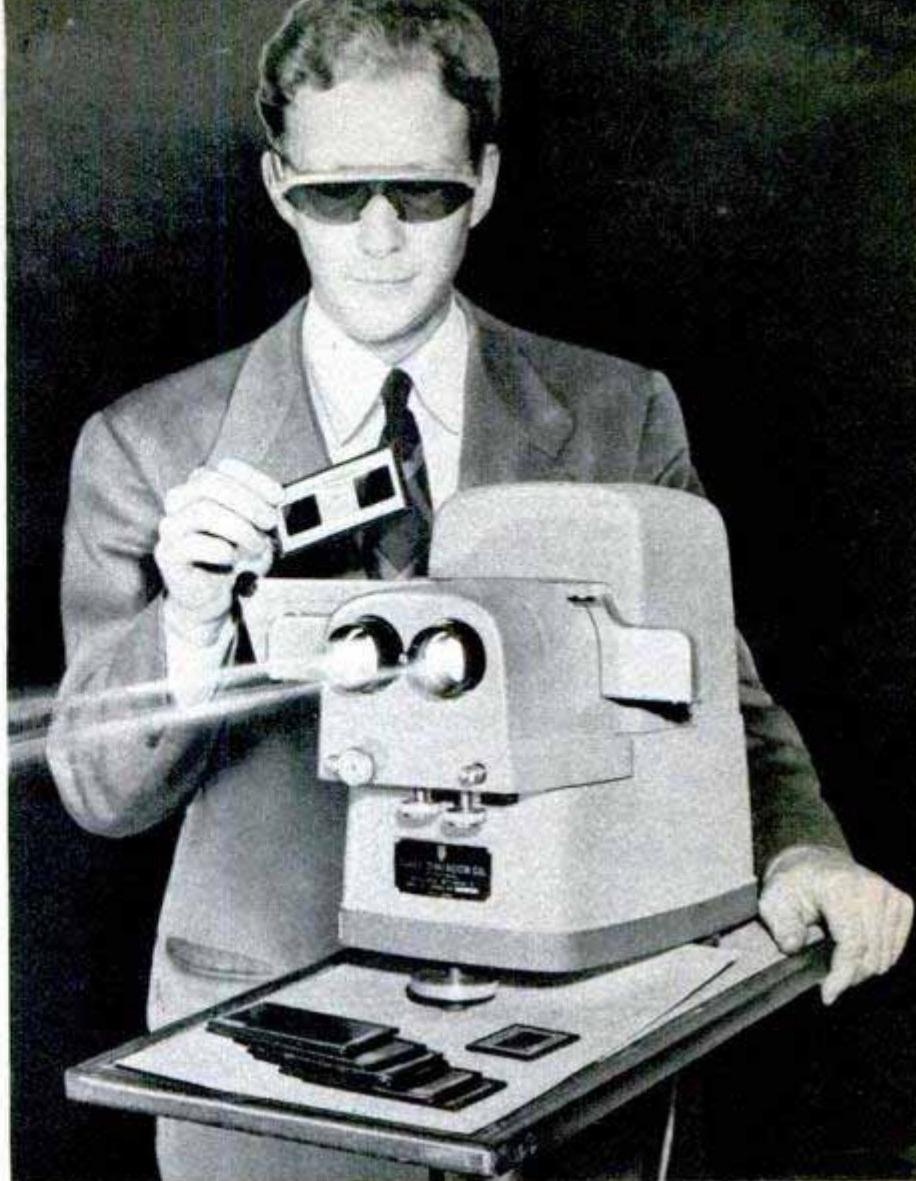
YOUR SCREEN becomes a "picture window" through which you see color slides in three dimensional realism when you show stereo transparencies with a twin-lens projector. The projected picture seems to step right off the screen and hang in mid-air with such naturalness that you're sure you are seeing the subject itself and not its picture!

The projector takes Stereo Realist slides, 2 by 2-inch stereo slides and the proposed American Standard slides without adjustment. It has two complete optical systems with matched f:3.5 fully corrected projection lenses. Secret of the three-dimensional effect is a pair of polarizing filters on the projector and matching polarized lenses on the spectacles worn by the viewers. Unlike old-fashioned three-dimensional projection systems, there are no colors added to the slides. No red and blue tints separate the two images. Polarization does the trick without changing the natural colors of your transparencies.

The special screen used is not beaded, but has a flat surface essential for three-dimensional effects.

The polarized spectacles permit the right eye to see only the image projected by the right lens and the left eye, the left-lens image. Lightweight, the spectacles are designed so they can be worn comfortably over regular glasses.

Without the spectacles, you see two images on the screen. Slightly out of register, they present a blurred view. But when you put on the glasses, the two images become one—a natural, just-like-the-original view that brings the wonders of nature indoors for you and your friends to enjoy time and time again.



Front view of the projector shows its twin lenses. It can be used to show single slides by turning off one projection lamp

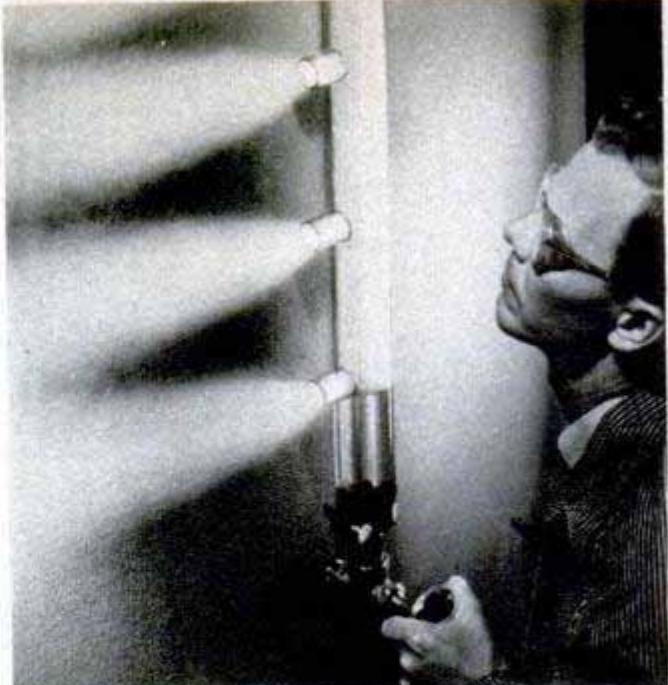
Below, three-dimensional color slides, taken on a stereo camera like this one, provide a new thrill when shown by projection





Post Straightener

Bent posts which are embedded in concrete are quickly straightened by a hydraulic tool. Designed for straightening parking-meter posts, the straightener does its job while the post is still in the concrete. A collar is fastened to the post and a hydraulic jack pumped a few times to apply pressure to the bend. The posts can be straightened whether they are bent toward the curb or sidewalk.



Plastic Shield for Glass Gauge

Liquid-level glass gauges are protected against accidental breakage by a plastic shield which also protects the operator against the escaping liquid and shattered glass should the gauge blow up from internal pressures. Designed for use on tanks or other vessels containing light oils, corrosives or poisonous substances, the Tenite plastic shield has three vent tubes on one side to divert the spray of escaping material away from the operator. Loose-fitting caps cover these vents to prevent foreign matter from entering, yet fit loosely enough so as not to interfere with the escape of spray should the inner gauge break.

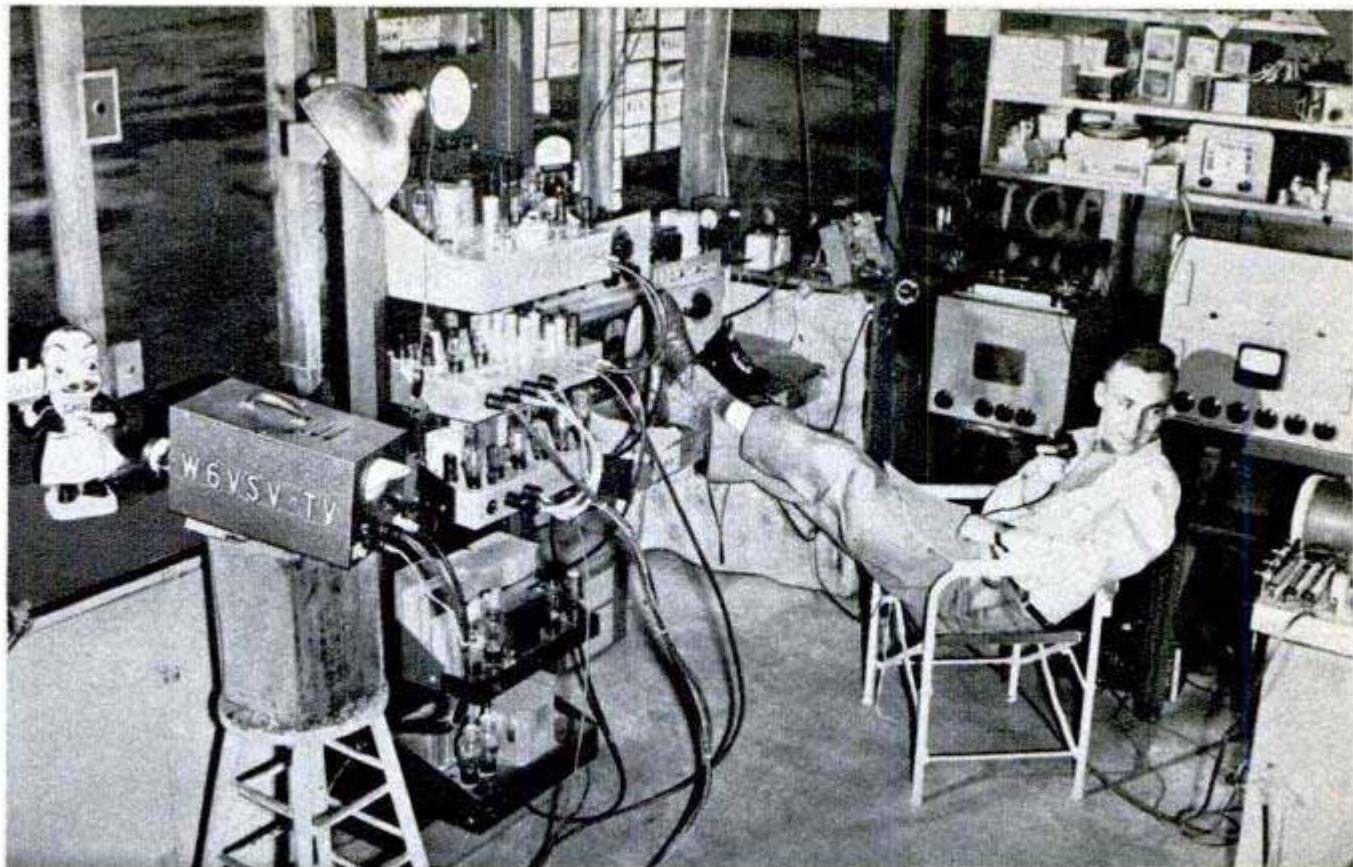
Hoist Somersaults Small Boat to Deck of Larger Craft

Even a cumbersome dinghy can be hauled aboard a sail or motor boat with a new end over end, into the larger craft. Two hoist. The hoist tumbles the small boat, straps are fastened to the dinghy. The boat-

man then pulls on a hoisting line, lifting the bow of the dinghy over until the boat slides, bottom up, onto the boat deck. During the dinghy's somersault, the water automatically is bailed out.

Straps are fastened to stern of the dinghy. When the line to the bow is pulled, the dinghy tumbles aboard





Above, Melvin monitors the image as he transmits his call letters, carried by "Rudy the Waiter," seen in front of camera. Left, picking up a program from his living room

Ham's TV Station Is All Homemade

In less than one month, a California radio hobbyist built himself a television station, complete with camera; that he now uses to broadcast amateur programs almost every night. The hobbyist, 23-year-old Bob Melvin, took over the family garage for his equipment. Members of his family serve as actors.



Sportsman's Wrist Watch Flips Over to Protect the Crystal

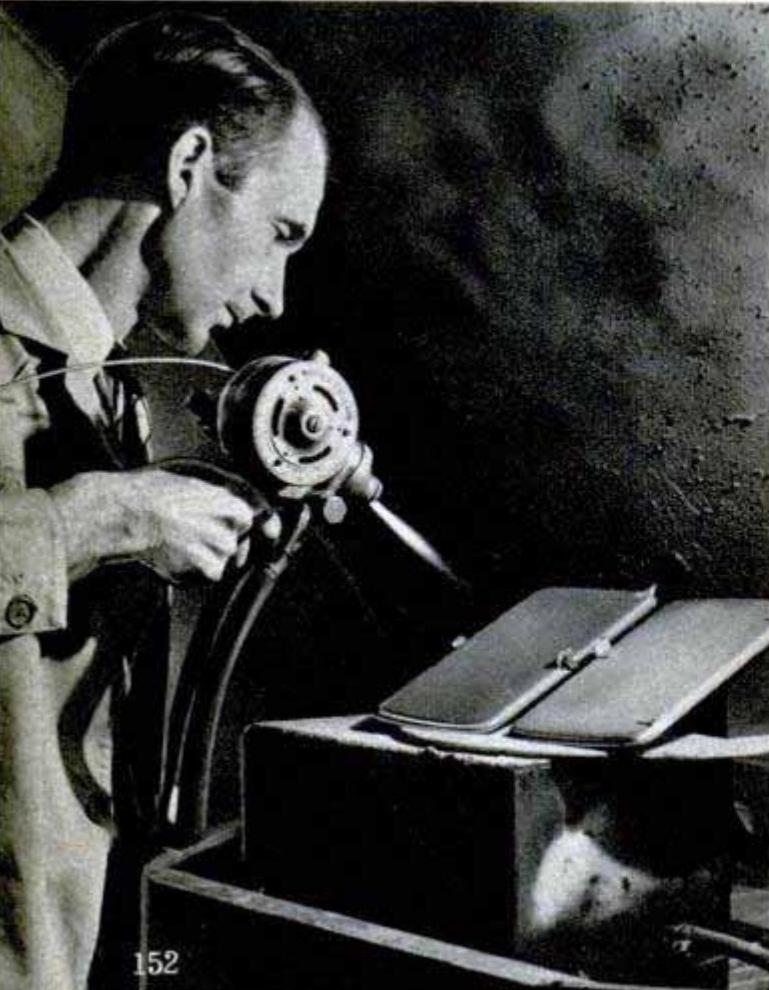
Sportsmen can wear a reversible wrist watch during the most strenuous games without danger of cracking the crystal or damaging the movement. When worn with the face out, the watch looks no different from any fine model. However, when there's danger of cracking the crystal in work or in play, the wearer simply swings the watch upside down so that the



steel back is up and the crystal is protected in the face-down position. Initials can be engraved on the back, if desired.



Four mechanical wizards puzzle over the problem of how to manufacture a new part for an air cleaner. Below, atomizer tool "liquefies" metal, then sprays it on worn parts to make them as good as new



SHORT-CUT

By C. G. Wallis

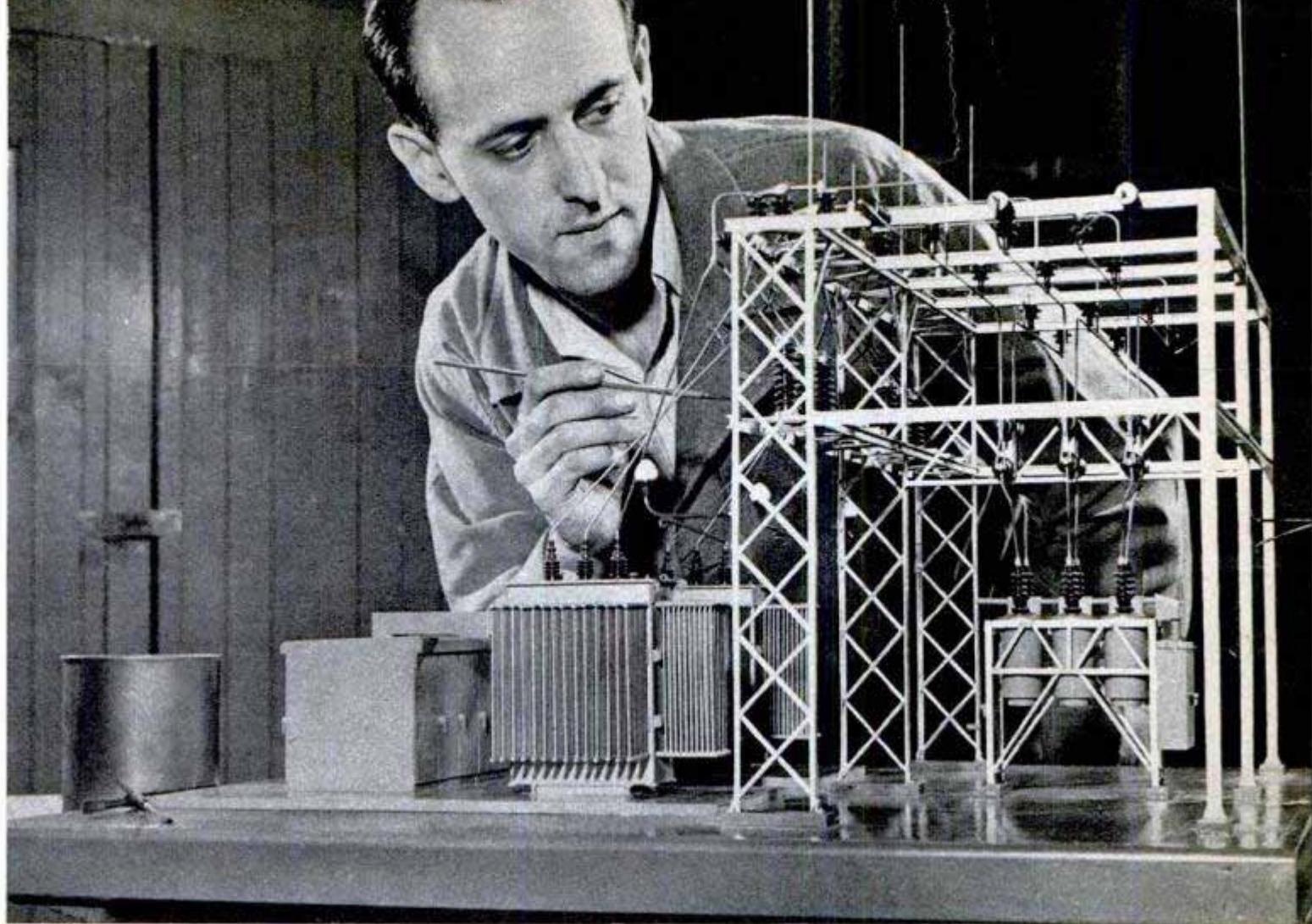
*Director, Westinghouse Headquarters
Manufacturing Engineering Dept.*

Did you ever hear of "painting" with molten steel? Or cutting brass with a rubber wheel?

A trip through the Westinghouse Electric Corporation's Manufacturing Engineering Department at East Pittsburgh, Pa., would show you these and hundreds of other production short-cuts that have brought the department the nickname of the "know how laboratory."

Many of these production techniques are original, some have been learned from others, but all add up to a quicker or more accurate way of meeting production problems that arise in Westinghouse plants.

The know-how laboratory was established in 1939 to help solve all kinds of how-to-do-it problems. To date, the lab has cooperated with engineers of Westinghouse operating divisions to turn out more than 1000 improved techniques for producing everything from electric appliances to giant generators.



Westinghouse photos

ENGINEERS

The constant aim of the lab is to boost production and to lower costs. Some of the methods used are fascinating in their simplicity. For instance, the simple technique of putting a notch in the cutting edge of a standard twist drill permits it to operate up to 10 times as fast as an unnotched drill—veritable “bullet speed” drilling. This means greater production of drilled parts.

A staff of 50 engineers and technicians have combined ingenuity and persistence to come up with such valuable new discoveries as “painting” with molten metal. Many Westinghouse plants felt the need for some method of repairing worn parts of expensive equipment.

The know-how engineers helped turn the trick by using a new tool developed by an atomizer concern. This tool, which “liquefies” rods of metal and then sprays the metal like paint, now is used to recoat with steel such items as worn or damaged bearings or screw threads. When refinished, these parts are again as good as new.

Many of the techniques not only save time and material, but frequently bring about an improved product. Although the method of cutting metals with abrasive

Expert modelmaker touches up a power substation which will be used in planning an efficient plant layout. Below, a disk made of rubber and abrasive makes a clean, fast cut through a bar of steel





Bullet-speed drilling works 10 times faster than ordinary methods. All that's necessary is to notch the drill

rubber disks that resemble giant type-writer erasers has been used in other industries, the lab has adapted the idea to production-line needs.

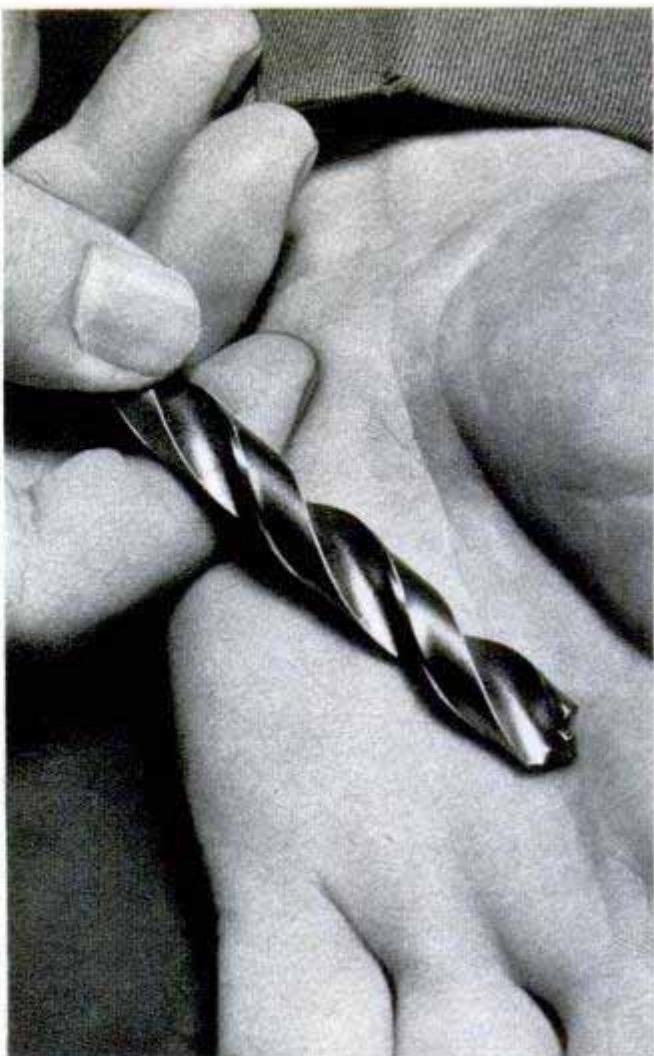
These disks, whirling at speeds up to 3500 revolutions per minute, depend on friction alone to cut brass, copper, steel and other metals. Not only do they cut the metal faster, but they also leave a much cleaner cut than saws.

Another of the new techniques makes it possible to weld long steel I-beams in one fifth the time of former methods. Moisture-proofing of rotating parts of locomotive motors now is being done in the lab in just three hours' time. It used to take two days.

Cast-iron "logs" weighing 1000 pounds are whittled into millions of iron chips in a lathe used for testing lathe cutting tools. After this Bunyan-sized job is finished, the cutting tools are examined under a microscope for wear.

A special power press which can exert 300 tons pressure "squeezes" intricate parts from solid blocks of copper. The parts which formerly required 12 separate operations are now made in one.

Models, too, are used to help lower manufacturing costs and speed the flow of finished electrical products to industrial and home consumers. The same "flow of



work" theories employed in scientifically planned kitchens are employed by engineers who build models. With these "toy factories" they can plan the location of machine tools and production lines to obtain the most efficient flow of work.

Plants based on this planning already have been built in Mexico and similar know-how is now being prepared to help other countries make electrical equipment to raise their standards of living.

The lab also serves as a training ground for showing young manufacturing engineers how industrial know-how, both for domestic use and for export, is manufactured "on order" in much the same way other divisions of Westinghouse manufacture giant electric generators, motors or transformers.

Besides testing new equipment, developing new techniques and gathering information for export, the lab serves as a clearing house for new developments in the various Westinghouse plants, aids in setting up new manufacturing processes and develops many new products of its own.

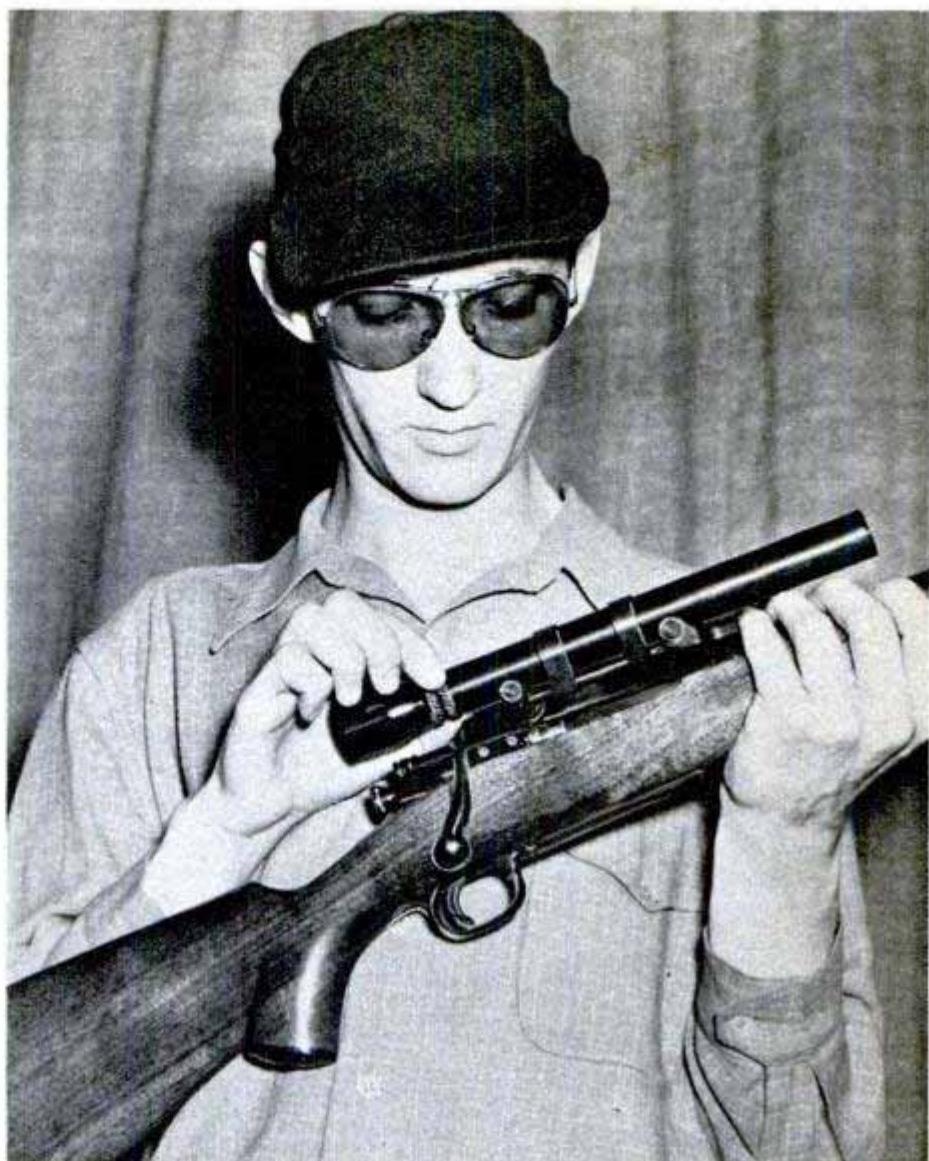
Such products include paint with a glass-smooth finish for spraying on electric appliances, an oilless washing-machine bearing and a collapsible metal container for factory handling of large machine parts.

Telescopic Sight Has Variable Power

Marksman can "move" right up on the target with a variable-power telescopic rifle sight that can be changed from $2\frac{1}{2}$ to 4 power by turning a knurled ring near the eyepiece. Changing the power doesn't alter the focus or eye distance. Windage and elevation adjustments are made in the mount instead of in the telescope so the sight can be attached to the gun without changing previous corrections. The reticle is permanently centered in the optical system, thereby eliminating image deterioration that often results when the position of the reticle is changed.

Carbon Monoxide Made Harmless

Carbon-monoxide poisoning can be prevented by a chemical, containing silver permanganate, which neutralizes the dangerous gas. The silver-permanganate powder is coated on granules of various metallic oxides to provide relatively large surface areas for exposure to the gas. These



coated granules could be placed in the ventilating systems of garages, mines, submarines, aircraft and tunnels to rid large volumes of air of the lethal gas.



Quick Oil Changes With Air Pressure

Service stations can drain the dirty oil from your engine in two minutes with an air-pressure-operated changer, making it possible to change your oil while you are getting gas. The device is automatic and shuts itself off when the crankcase is empty. An ejector tube is inserted in the dipstick or filler-tube opening and air pressure does the rest. The drain plug on the crankcase is not touched and pits or lifts are unnecessary. The unit is coupled to the station's air hose and wheeled alongside the car.



TV IS AT HOME ON THE ROAD



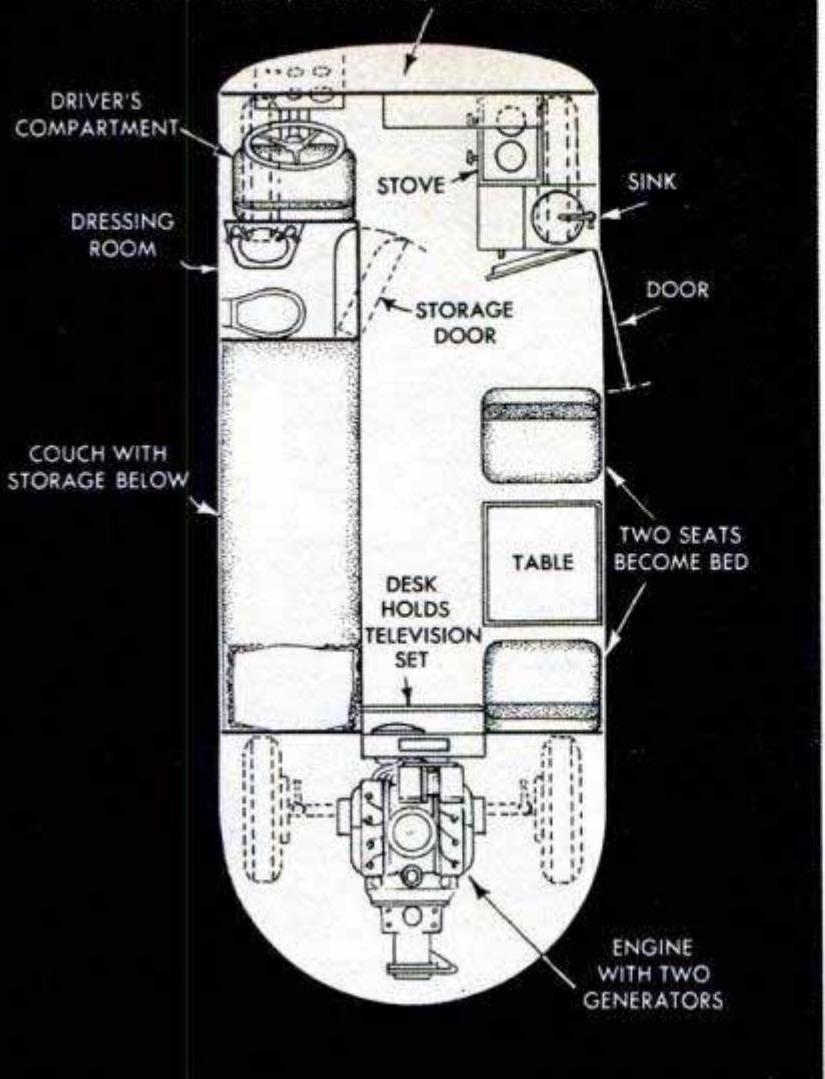
A TELEVISION SET, a broadcast receiver and an amateur 10-meter radio station which can work hams all the way from Australia to South Africa are part of the equipment of a "motor home" built by J. Roy Hunt, Hollywood motion-picture cameraman.

Eighteen feet long, Hunt's mobile home is powered by a stock Ford engine mounted in the rear, with air scoops to provide a flow of cool air through the radiator. Opposite the driving compartment is a galley that includes a butane stove, a sink with hot and cold water and a refrigerator. Groceries, pans and dishes are stored in cupboards. A compartment behind the driver's seat contains washstand, shower head, toilet, electric razor and medicine chest. The double door to the compartment provides wardrobe space inside and a full-length mirror outside.

The main living space, finished in

Top, the home on wheels has a sleek aluminum skin on a streamlined body. The TV antenna pulls in pictures whenever Hunt cruises into a broadcast radius. Left, mike for ham radio hangs near driver

TWO-WAY RADIO, GAS TANK, HOT AND COLD WATER



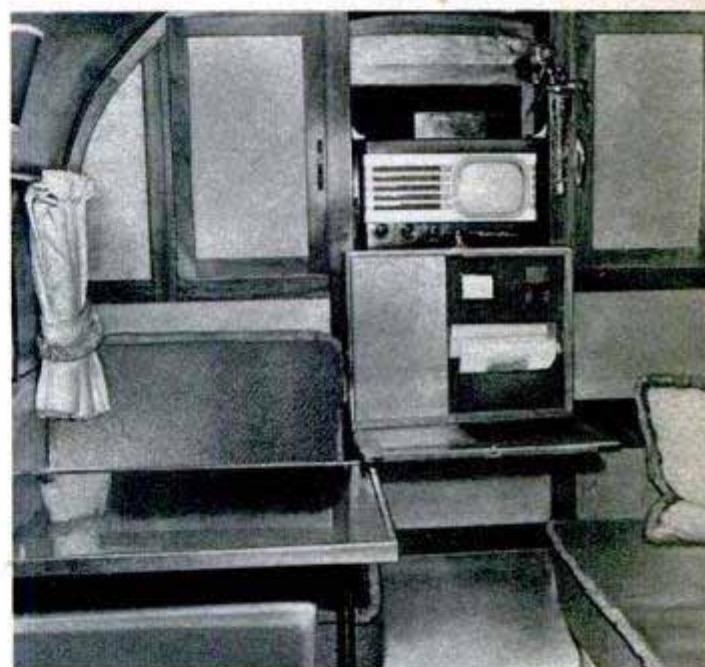
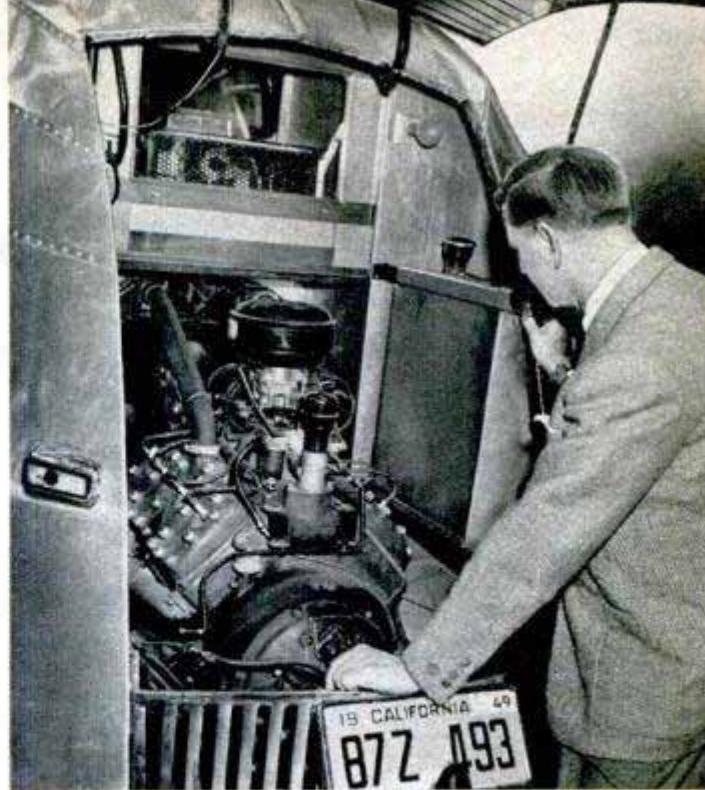
mahogany and birch, contains a couch that doubles as a bed, and a table with two cushioned seats that convert into a bed when the table is removed. A combination service table, writing desk and make-up kit may be lowered from the rear wall. The television set occupies a niche on the table.

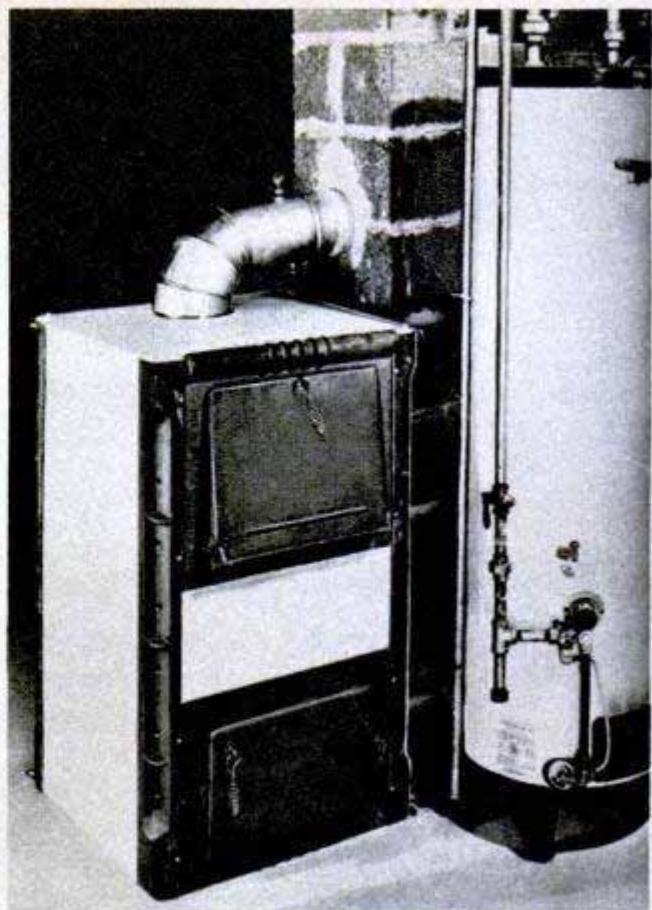
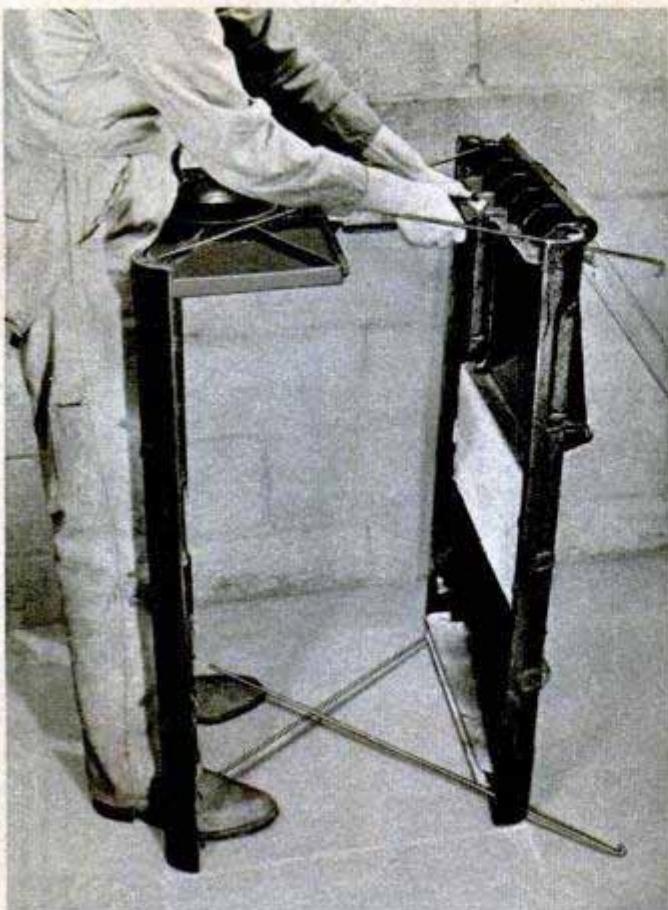
Hunt spent about \$10,000 and two years of work in building the house car, after making cardboard mock-ups of most of its parts. The chassis is built up of 1½-inch square chrome tubing and the exterior skin is aluminum. All structural parts are welded or riveted.

Electric power for the radio equipment and the numerous interior lights and exhaust fans is provided by batteries connected to auxiliary generators on the engine and also by a small electric-light plant mounted in the front of the car. Hot water is heated either by engine exhaust or by a special butane burner. Twenty gallons of cold water and 18 gallons of hot water are carried in tanks above the driving compartment.

Ready for the road, the car weighs 4630 pounds. It is equipped with oversize tires, safety tubes and a truck-type transmission. It handles equally well in traffic and on twisting mountain grades.

Drawing shows space-saving arrangement inside the mobile home. Top, right, Ford engine is mounted above the rear axle and cooled by air scoops. Center, living compartment features television set, couch, table and chairs. Right, galley has hot and cold water, refrigerator, stove and cabinets





Basement Garbage Incinerator

Homeowners can build their own garbage incinerator with a kit containing all the parts except firebrick and other materials that can be purchased locally. Metal parts in the kit form a frame to which firebrick, flue pipe and damper are attached.

The incinerator is connected with the furnace smoke pipe. Refuse placed in the incinerator burns from the top down, acting as its own fuel. Four jets of air from the corners of the unit aid combustion. So little ash remains that it need be removed only once in every three or four months, according to the manufacturer.



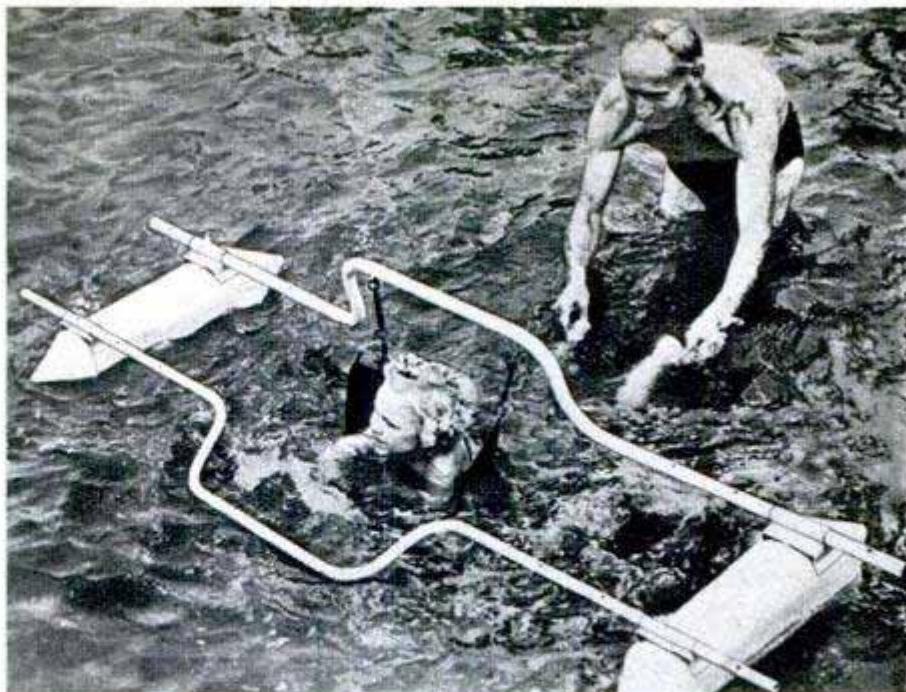
Weed Sprayer for Corn Fields

Riding high on stilts, a spraying machine kills weeds in corn fields up until the time the corn reaches maturity. The sprayer has a clearance of eight feet and straddles two rows of corn as it moves down the field at a speed of about four miles an hour. A

40-foot boom extends out from the machine at right angles to its direction of travel. Spraying tips hang down between the rows to spray weeds between 10 rows of corn. The machine has four-wheel drive with knee action in the front wheels. It was designed and built in this country for use in Venezuela.

Pontoon Harness → Aids Swim Students

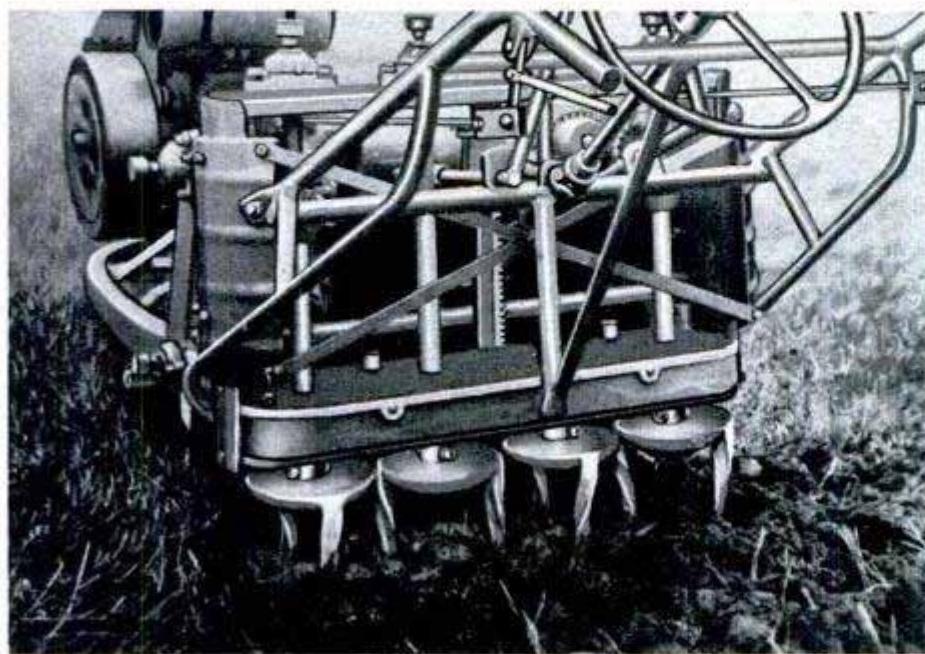
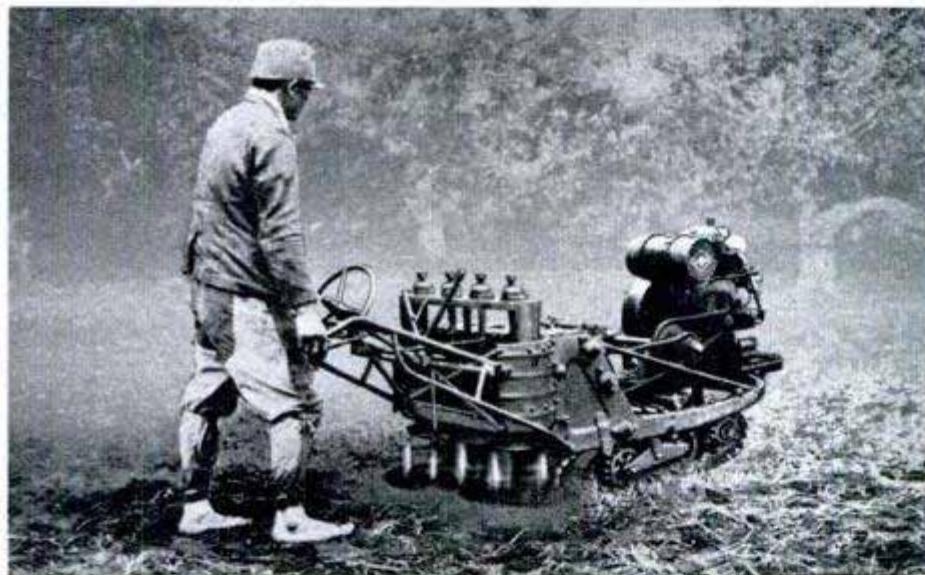
Pontoons bridged by a tubular-steel frame support a harness in which children and grownups can learn to swim. The harness hangs on adjustable chains. Invented by a Duisberg, Germany, swimming teacher, it supports the beginner while he is learning to use his arms and legs properly.



Rubber Playgrounds

Falling on a new playground will almost be fun —its surface is rubberized to prevent skinned knees and make shoe leather wear longer. At Akron, Ohio, a test installation has shown its effectiveness. For the new surface, ground rubber replaces crushed slag in the

asphalt mixture. There are no abrasive particles on the surface and, although Johnny won't bounce when he falls, at least he won't rip the skin off his knees.



Japanese Plow

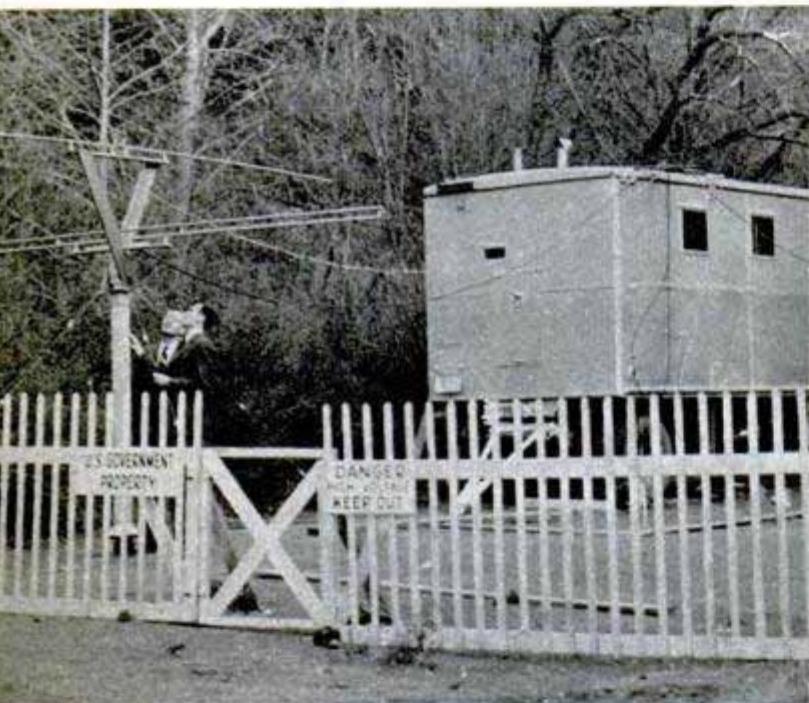
Four claws rotate horizontally on a Japanese plow, breaking up the soil to a depth of seven inches. Powered by a small air-cooled engine of $2\frac{1}{2}$ to 4 horsepower, the plow is expected to relieve some of the equipment shortage on Japanese farms. The machine moves at a speed of about one mile an hour and plows a strip 30 inches in width.

Scheduled airlines in the U. S. are expected to fly a total of 6,500,000,000 passenger miles this year, nearly 500,000,000 more than in 1947, which was the record year.

Sources of available products described in this issue are listed in the WHERE-TO-BUY-IT INDEX, pages 10, 12 and 14. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT INDEX, which is available without charge from Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

LISTEN to the falling stars!

Have you ever heard a cosmic wolf whistle? It's music to the ears of the meteor hunters, listening in by radio as a castaway in space streaks toward earth in its suicide plunge



"Radio camera" is located in mountain bowl to eliminate direct signals from distant transmitter. Two antennas pick up "sounds of the stars." Below, mechanical pen records information on meteors picked up by the radio



EVERYONE has seen falling stars but how many people have heard them? Half a dozen individuals, at least. These are the scientists who are participating in radio-meteor studies conducted for the Navy by Stanford University.

In a mountain valley near that school you climb into a trailer loaded with radio gear and put on a pair of earphones. All you can hear is a faint hum and then, suddenly, there's a shrill whistle. It starts high and comes down the scale, a drawn-out note of descending pitch.

"That's a meteor," the technician at the receiver tells you. "Sounds like a cosmic wolf whistle, doesn't it? Judging by the tone and duration, it was about the size of a pea and was traveling 37 miles per second. It slowed down as it encountered the resistance of the upper atmosphere and it burned up 50 or 60 miles overhead."

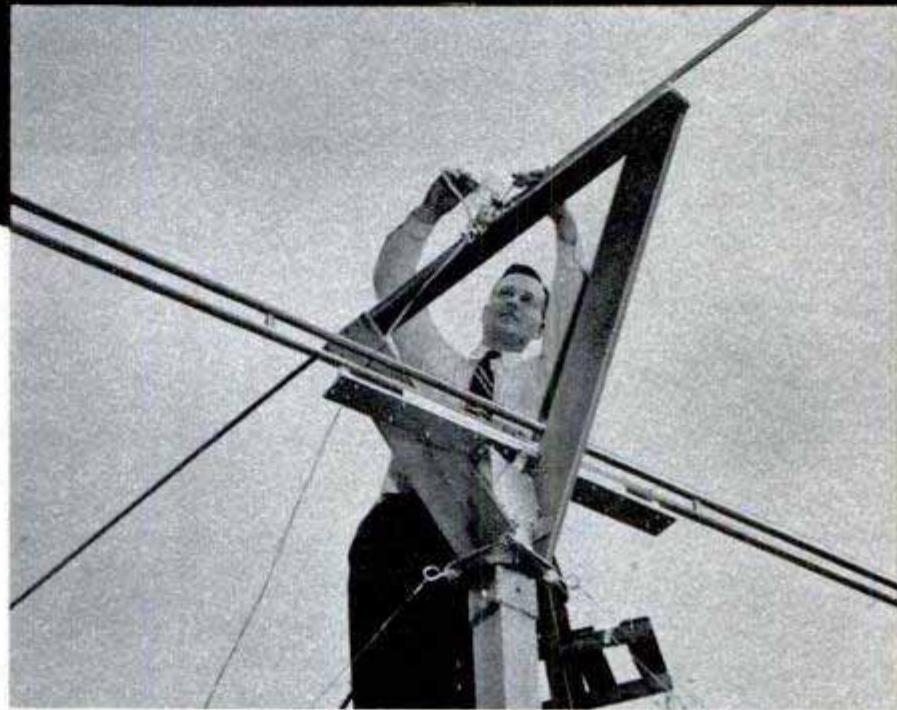
In the next few minutes you listen to a dozen more of the eerie whistling sounds, some loud and some weak, as additional meteors plunge into the atmosphere and are consumed by friction. None of them would have been bright enough to have been seen by eye, but each was faithfully recorded by the equipment in the trailer.

Practically speaking, the equipment comprises a radio camera 100 times more sensitive than the human eye and possibly 10,000 times more sensitive than an astronomical camera. Devised by Professors Oswald G. Villard and Lawrence E. Manning, the camera consists of a radio transmitter and a receiver, spaced six miles apart. The receiver is placed in the bowl of a mountain valley to reduce the strength of the direct signal.

100 MILES

75 MILES

50 MILES



Drawing shows how meteors, falling into the earth's atmosphere, leave ionized trails which bounce radio signals back to earth. Above are shown the directional antennas which can be aimed to pick up reflected signals

Radio-coordinated cameras also record the meteors. At dusk, roof and sides of trailer are slid back along track to open the skies to the cameras. Eighteen miles away other cameras will take matching pictures





Here's a photo of a falling meteor. Camera with shutter rotating at 600 r.p.m. records trail as a broken line

While Stanford is keeping watch on meteors, Harvard College Observatory is making comparable studies with pairs of astronomical cameras that employ synchronized rotating shutters. English scientists are using radar to study meteors. Other research programs likewise are aimed at learning more about these bits of cosmic "driftwood."

The reason for this sudden interest is that future rockets will be traveling through the thin upper reaches of the atmosphere. Wind conditions and other phenomena have an effect on any rocket's course. Meteors are a handy means by which these conditions can be studied. That's why the Navy's Bureau of Ordnance is sponsoring both the Stanford research and the Harvard Meteor Expedition that has been operating near Las Cruces, N. Mex.

Almost all meteors are burned up by friction, but a few reach the earth and yield valuable information

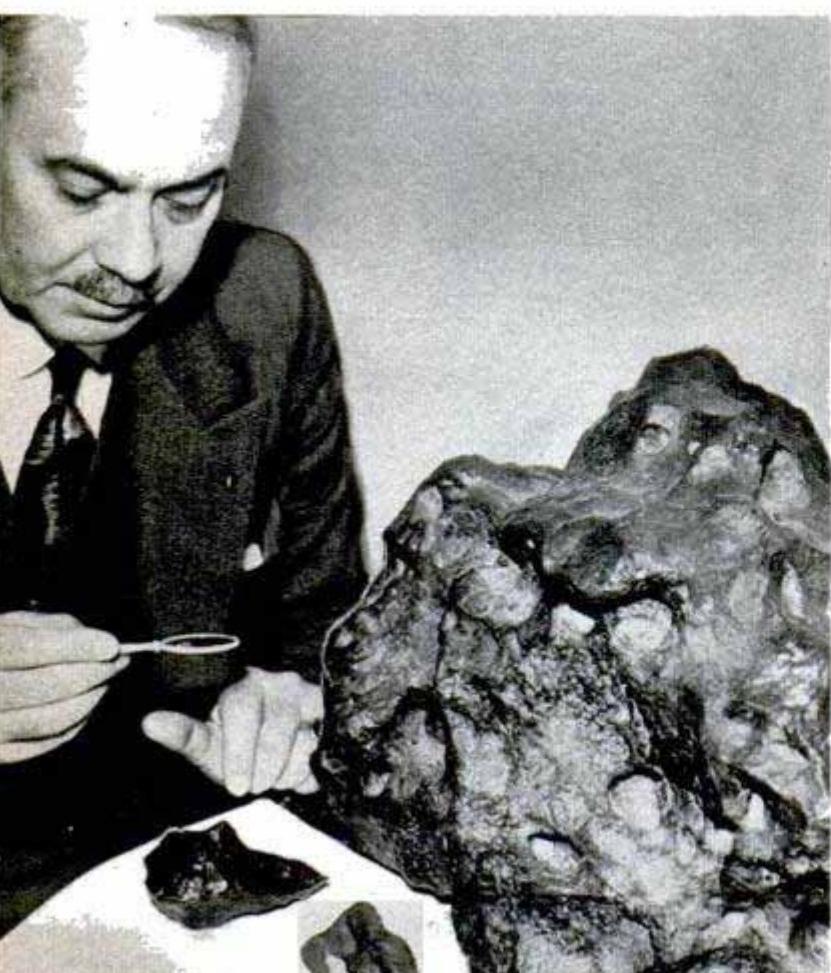
It is estimated that a gravel truckload of meteoritic material is collected by earth's gravity every day. Most of it consists of minute particles but even the smallest of these move at tremendous speed. The so-called shower meteors may be traveling as fast as 133,000 miles per hour while the very slowest move at a 43,000-mile-per-hour pace. Traveling at top speed, a bit of material no larger than a pea generates about as much energy as a big locomotive.

Only rarely is a meteor large enough to plunge through the ionosphere and the lower atmosphere and land on the earth's surface. These meteorites may be smaller than a man's fist or they may measure three feet or more in diameter. Possibly once in 1,000 or 10,000 years a great meteorite strikes the earth. Of these, one of the largest was the million-ton-plus nickel-iron mass that created the 4100-foot-wide Meteor Crater in what is now Arizona. Small meteorites and fragments of the larger ones have told scientists a great deal about the composition of the solar system and about the interior of our own earth.

Harvard is concentrating principally on obtaining pairs of matched photographs of the larger meteors, from which very precise information can be obtained.

An expedition in the New Mexican desert has erected two stations 18 miles apart, each equipped with three cameras attached to astronomical mounts that turn in a direction opposite to the earth's rotation. These permit pin-point time exposures of the stars. Each camera has a rotating shutter that turns at a speed up to 600 revolutions per minute. Thus, in a time exposure, the images of the stars will be sharp and clear and the trail of any visible meteor will be recorded as a straight or curved line, broken into short segments by the shutter action. Knowing the shutter speed, the speed of the meteor can be calculated at any point.

Each of the three cameras at one station is pointed toward a different portion of the sky and each is paired off with a twin camera at the other station. The fields of each pair are aimed to coincide at an altitude of





Rotating shutter causes breaks in photo of meteor trail. Measurement of breaks shows deceleration of meteor

70 kilometers and the shutters of each pair are synchronized by radio.

By studying photographs made simultaneously by twin cameras, it is possible to calculate almost to the yard the altitude at which a particular meteor heated up brightly enough to be photographed, and the lower altitude at which it disappeared. Deceleration of a meteor can be determined by studying the length of the segments that make up its trail, and this leads to information about the density of the ionosphere and the stratosphere.

With luck an observer may see possibly 10 meteors in an hour but only an occasional meteor is brilliant enough to leave an image on a photographic plate. Robert E. McCrosky and the other young meteor hunters at Las Cruces spend night after night on watch, camera shutters whirling, without getting a satisfactory picture. One good set of pictures per week is average.

To speed up the program, the expedition is being equipped with a pair of new spe-

cially designed super-Schmidt telescopes to which molded curved photographic films will be attached. Each Schmidt will have a 52-degree field and will pick up many meteors that are not bright enough to be photographed by the present equipment. Later, a similar station 80 miles north of Edmonton, Alta., will be similarly equipped. Meanwhile, additional meteor research is being performed at Harvard Observatory itself under Dr. Fred L. Whipple, director of the Harvard program.

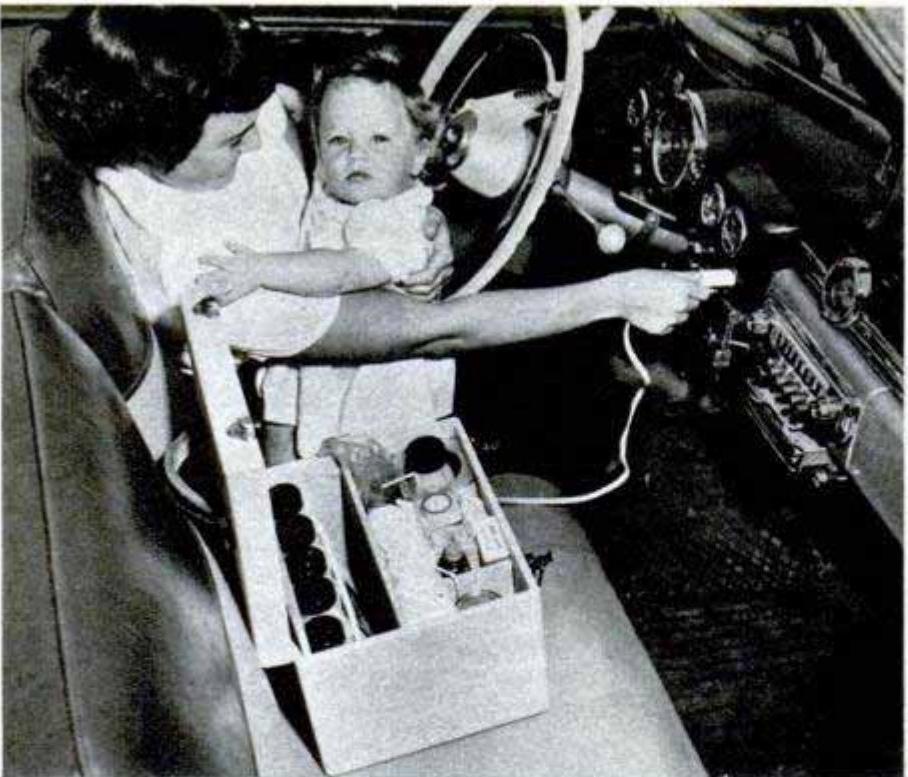
From the military standpoint the research on meteors is expected to make it possible to aim rockets more precisely and yield new information on ballistics.

More than that, it should contribute new information to other fields. The upper-air tides that have previously been called a theoretical enigma now are proving to be very real. Studies of meteor pictures confirm the theory that in the northern hemisphere the density of the atmosphere 50

(Continued to page 252)

Thousands of years ago a giant meteorite smashed into earth at what is now Arizona, digging hole 570 ft. deep



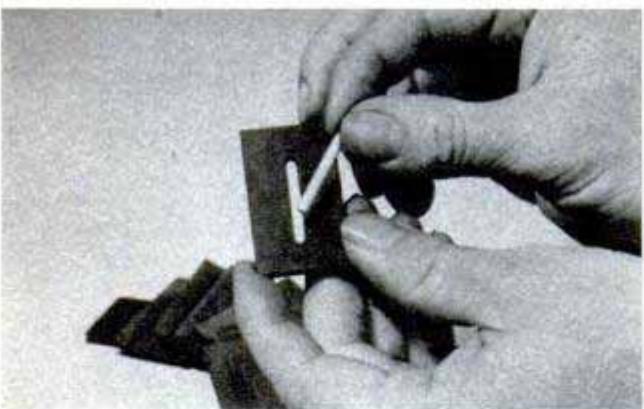


Baby's Travel Kit Carries Dry Ice

Everything that baby needs on a long automobile trip is carried in a travel kit that has a built-in bottle warmer. The cord for the dry-type bottle warmer plugs into the cigarette-lighter socket. An insulated section in the easy-to-carry box keeps six filled bottles cool with Dry Ice. Space is also provided for an ample supply of food cans, powder, soap, medicine, diapers and other essentials for baby's comfort and health. The box is covered with a washable material and has a convenient handle.

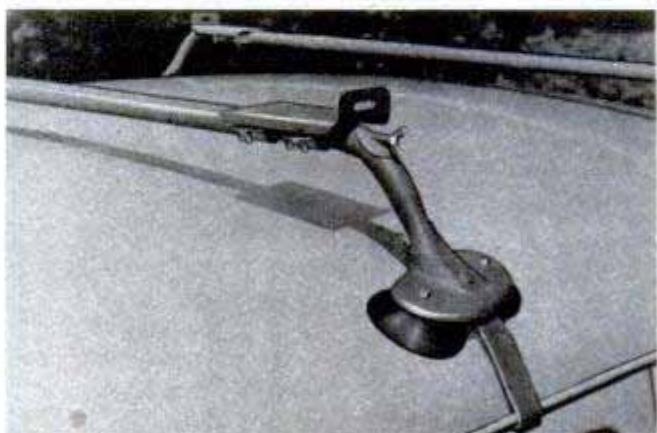
Roller Bearings for Leaf Springs

Squeaking springs are eliminated by neoprene pads in the center of which are inserted metal rollers to reduce metal-to-metal friction. The pads are placed between the spring leaves near the ends and the rollers produce noiseless flexing. A screwdriver, wedged between the leaves, opens the spring enough to allow insertion of the pads. According to the manufacturer, the pads make spring lubrication unnecessary.

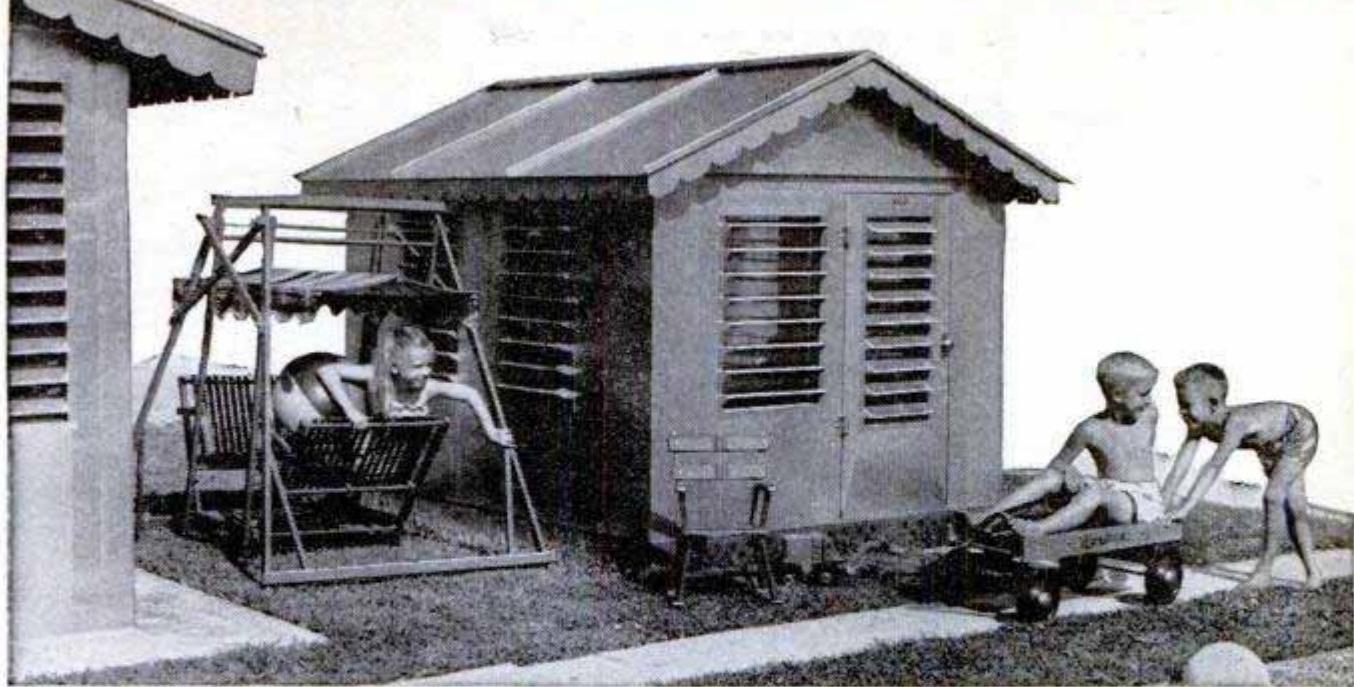


Quick-Acting Car-Top Carrier

It takes only a few seconds to attach or remove a new car-top carrier that is tightened or loosened by means of a convenient wing nut. The carrier, of tubular construction, telescopes as the nut is turned, tightening rubber-covered metal claws against the rain troughs. No metal touches the car finish and there are no fabric straps to stretch and loosen their grip on the rain troughs. Twin suction cups rest on the crown of the roof where the strength is greatest. The adjustable load trays can be locked in any position on the crossbar to accommodate loads of various widths.

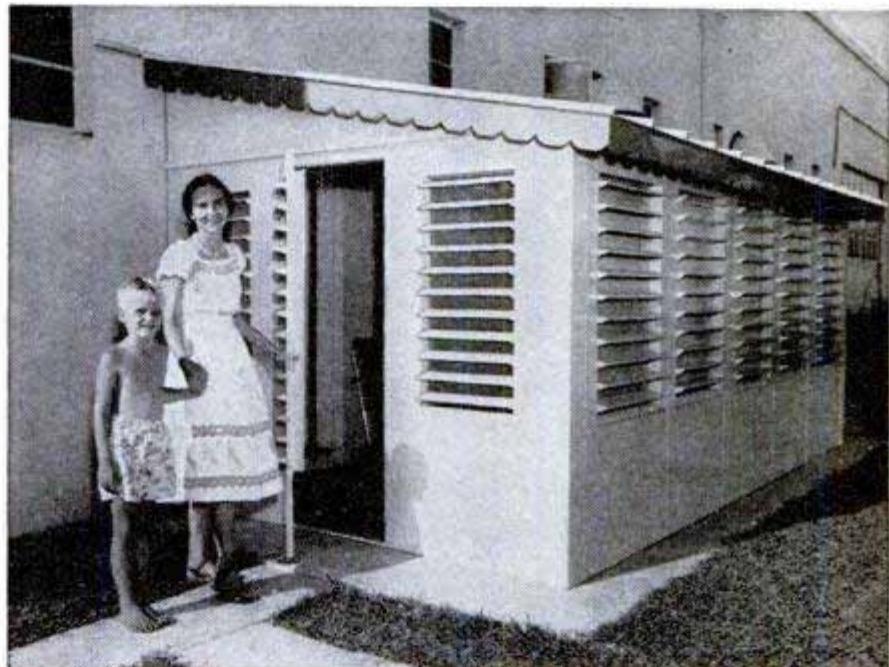


EXTRA ROOM FOR TRAILER OR SMALL HOME

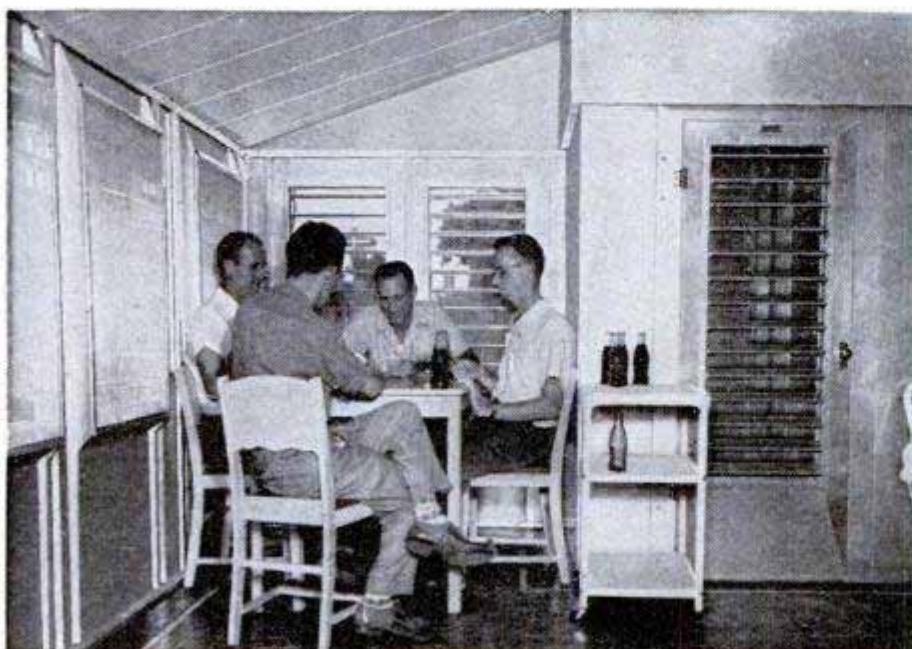


Sturdy and hygienic, this back-yard playhouse can be taken down easily; requires almost no maintenance

If you live in a trailer or small home, you can add an extra room with a prefabricated kit that goes up without nuts, bolts or nails. Clips hold the interchangeable panels together, permitting the room to be taken down and moved, if desired. Wide louvers provide light and air with protection against rain. Also available in the same design are small playhouses, suitable for "outdoor" eating and recreation.



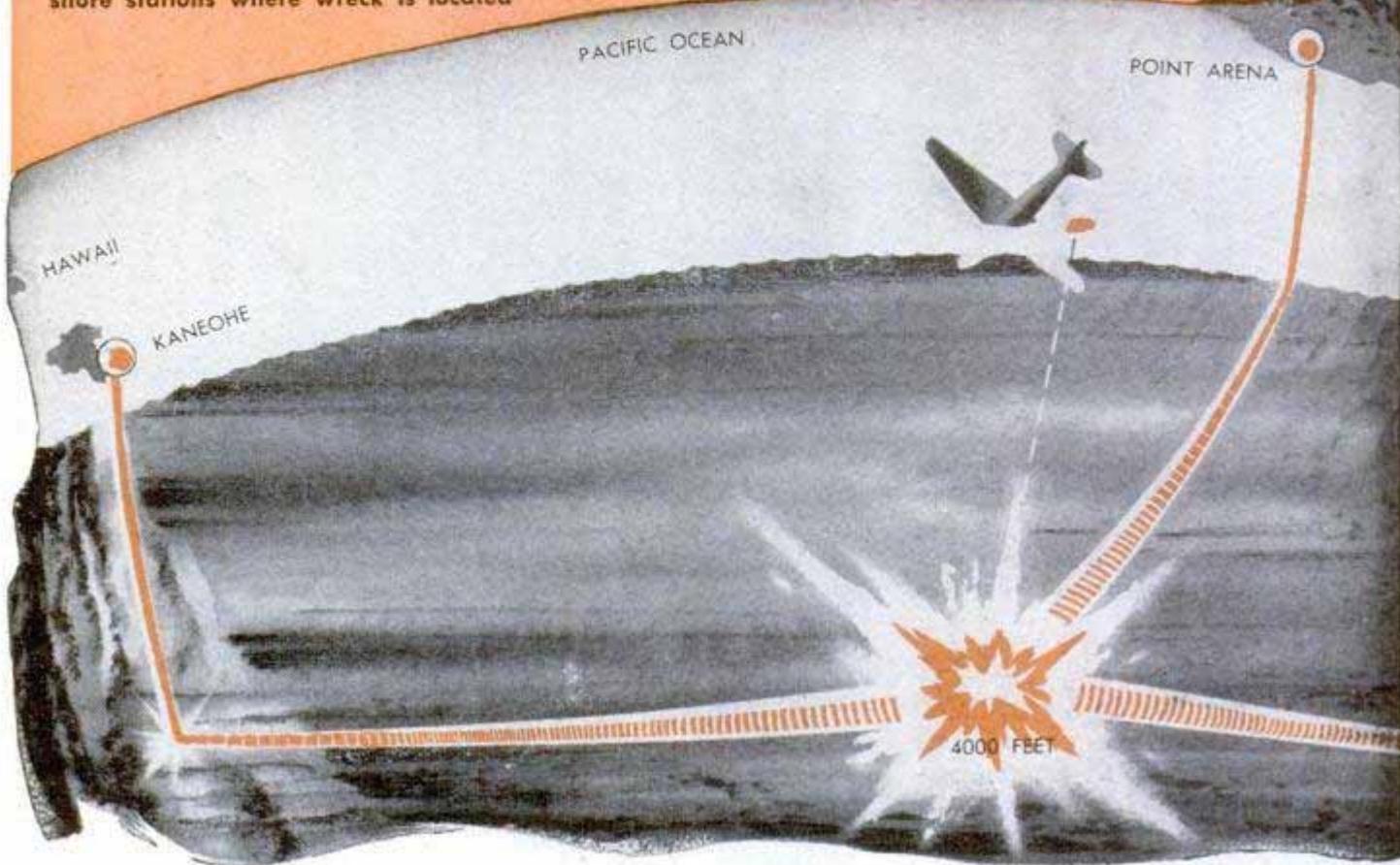
Above, shown here alongside a building, this all-metal room is designed to be attached to a trailer, providing an extra living room for the trailerites. The prefabricated kits come in models to fit various trailers



Left, light and airy, the room is a fine place for the weekly card game with the neighbors. Even the screens are aluminum, as is everything but the floor

SOFAR - the navy's lost and found

When a plane crashes, it drops a bomb into water. Sound from the bomb tells shore stations where wreck is located



By Andrew Hamilton

THE NAVY is making it harder and harder these days for plane and ship voyagers to get lost at sea. In fact, the saga of Eddie Rickenbacker and his companions who drifted for days in a rubber life raft may seldom happen again.

The reason? SOFAR.

An abbreviation for Sound Fixing And Ranging, the name SOFAR describes a new underwater sound system that will plot the position of downed planes and wrecked vessels 2500 miles at sea within a mile of the point of accident. A rescue plane will be winging help within an hour. Without SOFAR, it would be necessary to search thousands of square miles of ocean.

SOFAR covers much greater distances than LORAN or radio direction finders and its accuracy is comparable to that of first-rate celestial navigation.

Under exhaustive tests by the Navy since first announced in 1946, the Pacific SOFAR network has now been set up and is expected to be in full operation next year. Stations are located at Kaneohe Bay in the Hawaiian Islands and at Point Arena and Point Sur along the California coast.

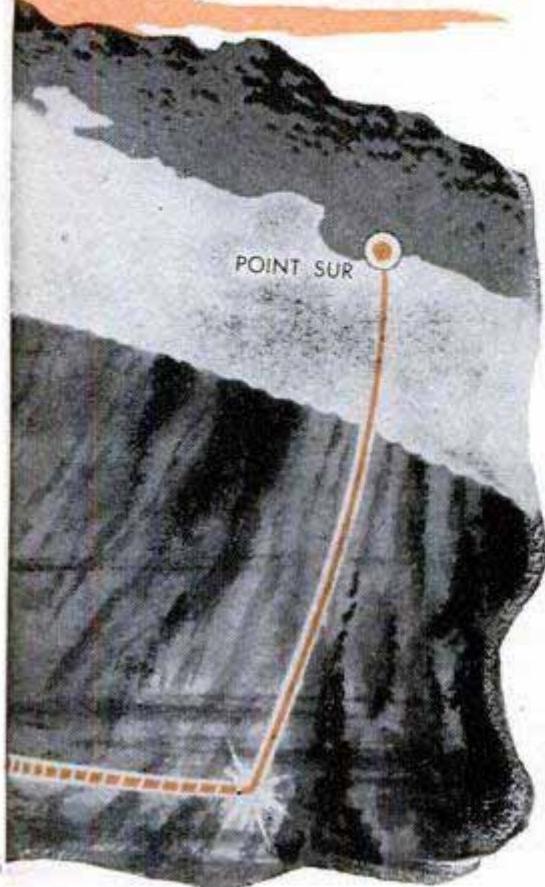
The principle of SOFAR is a simple one. When a ship or plane is in trouble and requires help, a small, underwater bomb is dropped into the sea. It sinks and explodes several thousand feet down—sending out sound waves in all directions at the rate of about one mile per second. It is like ripples from a rock tossed into a pool. These sound waves are picked up minutes later by monitoring stations and by means of special SOFAR charts, the distressed vessel or aircraft is located.

SOFAR is a by-product of wartime submarine-detection studies carried on for the Navy's Bureau of Ships by Dr. Maurice Ewing, then director of research in physics for the Woods Hole Oceanographic Institution and now professor of geology at Columbia University.

Professor Ewing's studies demonstrated that, as a result of an amazing "speaking tube" effect in the ocean, sound travels great distances at depths between 1500 and 6000 feet. In general, the depth of the sound channel becomes shallower the farther north or south of the equator you go.

In 1943, during tests conducted under

agent



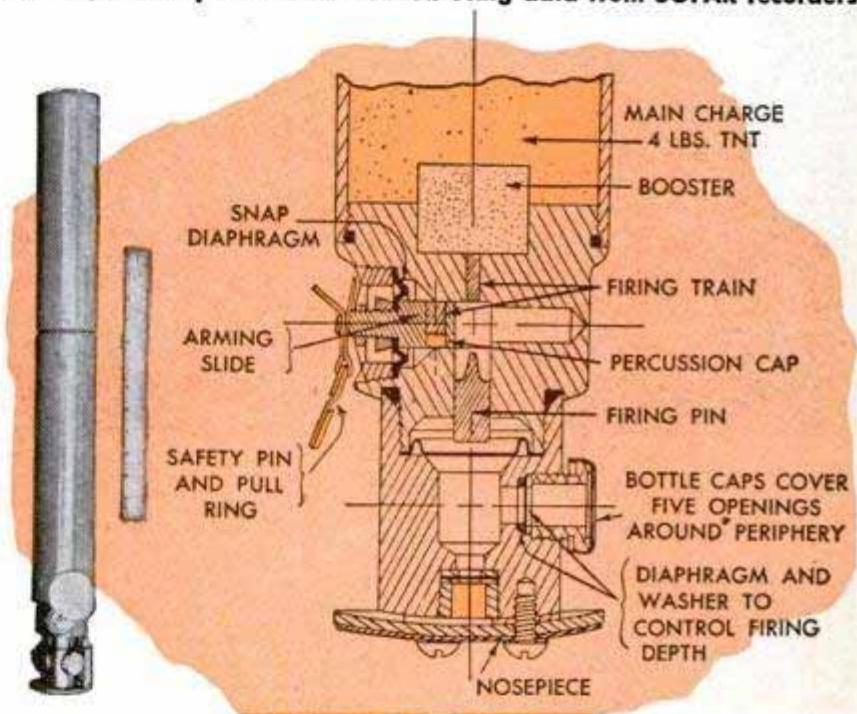
Ewing's supervision in the Bahamas, sound was heard 100 to 300 miles away when bombs were exploded at 600 feet. But when the depth was increased to 4000 feet, the sound was detected as far away as Dakar, North Africa, 3100 miles. Previous to this research, no man-made underwater sound had been heard more than a fraction of this distance.

Beneath the surface of the sea, sound does strange things. For example, at the point of explosion the noise will last not more than one second. But 2000 miles away it can be heard for as long as 24 seconds. The signal at the receiving hydrophones sounds like a kettle drum building up to a sharp, grand finale — after which it ceases abruptly.

This building-up process is caused by the fact that sound travels by multiple paths back and forth across the sound



Above, officer plots wreck location using data from SOFAR recorders



Above, diagram of firing-pin end of SOFAR bottle-cap bomb. Left, a photograph of the bomb alongside a foot ruler. Below, automatic receiver that sounds an alarm and records the signal on tape and wire





Pulling in a sample of water from the deep. Scientists took hundreds of such samples in developing SOFAR

channel while the finale travels directly but slower. The sharp, concluding finale makes time measurements possible to within $\frac{1}{100}$ second.

The "speaking tube" zone through which sound travels great distances in water is created by the joint action of temperature and pressure. As sound waves approach the top or bottom of the sound channel, they are bent back toward the center. Sound originating above the zone is absorbed by reflection from the surface and by bubbles due to waves. Sound below the zone is absorbed by the ocean bottom.

Changes in speed of sound in water result from changes in water temperature and pressure. Hence, sound travels faster near the surface where water is warmer and also near the bottom where pressure is greater. For this reason, the speed of sound is slowest in the middle of the speaking-tube zone and fastest when bent away from top and bottom.

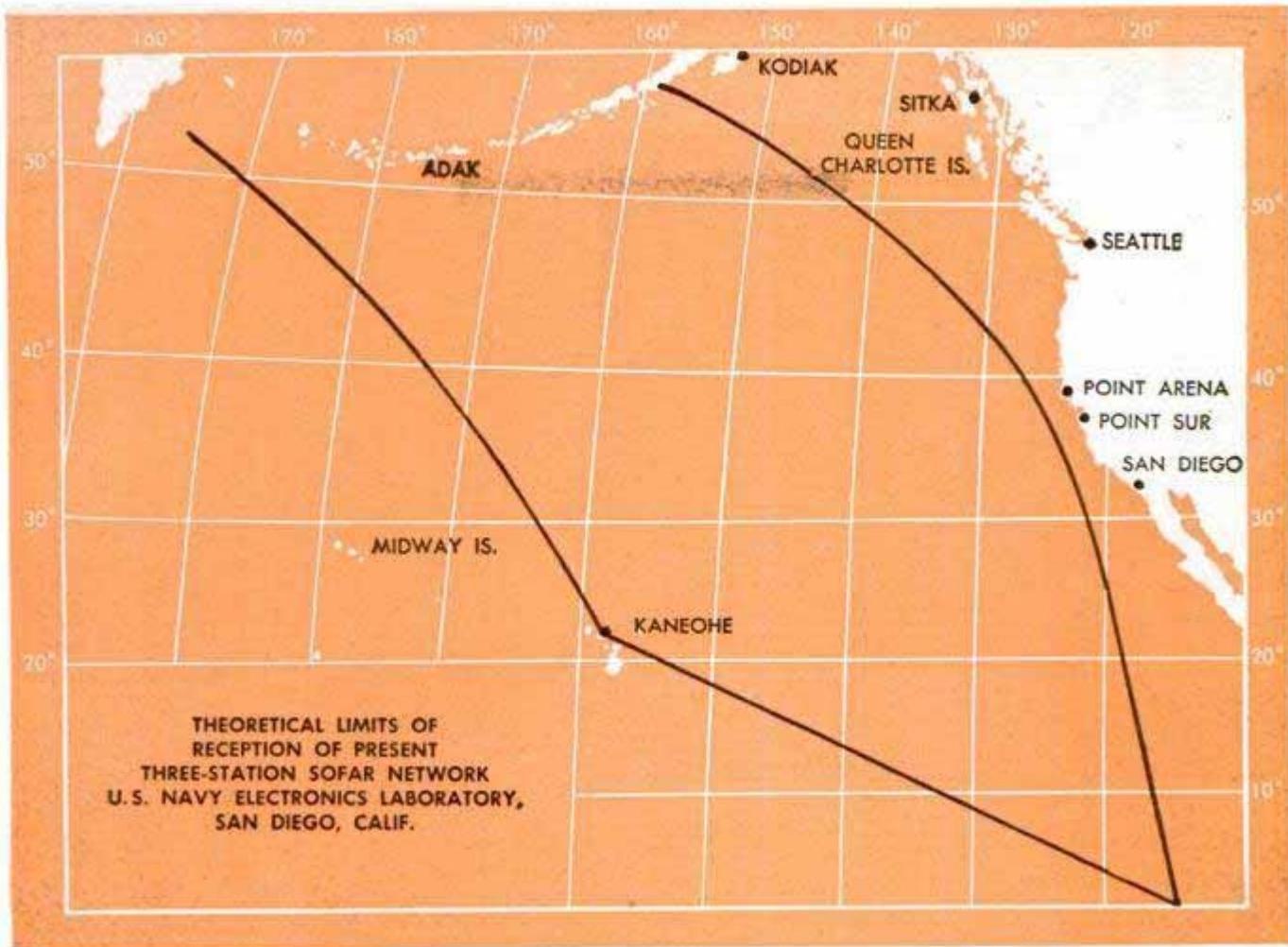
The possibilities of using these discoveries in an air-sea rescue system were readily apparent. During the latter stages of World War II, the Navy's Bureau of Ships and the Woods Hole Oceanographic Institution began the development of a

SOFAR locating system. After the war, the Bureau of Ordnance and the Naval Electronics Laboratory were drawn into the picture—especially in the designing of an underwater bomb (or signal as the Navy prefers to call it).

The problem was to build a signal bomb that would be light in weight, easy to store in a ship or plane and foolproof in operation. There would be times when it might have to be set off by passengers who wouldn't know a firing pin from a fin, a percussion cap from a piston.

It was decided to take the Navy's Mk. 15 practice depth charge and redesign it for use as a SOFAR signal bomb. Many models were blueprinted and several built. Finally, an engineer at the Naval Ordnance Laboratory came up with a unique idea—the "bottle cap" design, which has now been adopted as the SOFAR bomb. It is a small bomb, approximately 28 inches long, 3 inches in diameter, weighing 13 pounds and holding four pounds of T.N.T.

The name comes from ordinary crimped metal caps (like those used on soft-drink bottles) which cover five openings around one end of the bomb. There is a sixth opening in the bottom which is not capped.

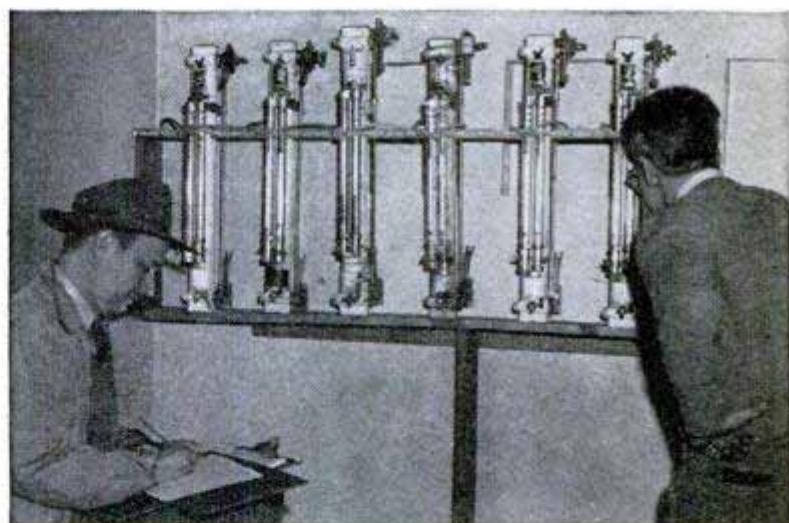


When a downed pilot takes to his rubber life raft, he consults a small chart which comes with the bomb and determines the correct exploding depth according to latitude. With an ordinary bottle opener, he wrenches off the corresponding bottle cap. The five openings around the side of the bomb are for explosions at 1500, 2000, 2500, 3000 and 3500 feet. The hole at the end is for 4000 feet. Thus, the bomb will automatically fire at that depth if for some reason one of the other caps is not removed.

As the bomb sinks through the water, pressure is built up on a thin metal diaphragm exposed by the removal of the cap. At the

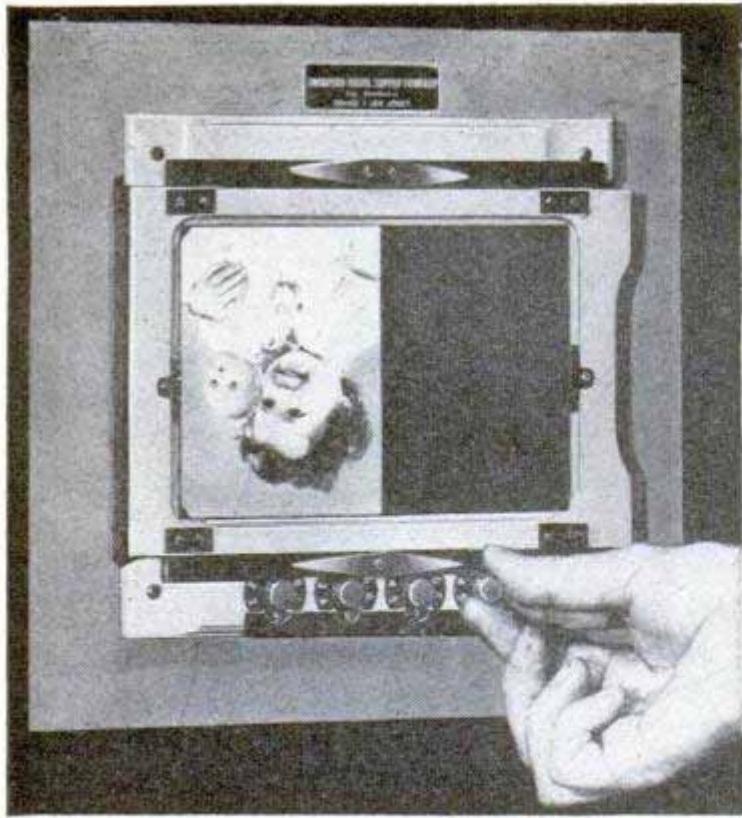
(Continued to page 246)

Above, ships and planes in area outlined on map will have a good chance of being spotted by the present SOFAR network



Above, analyzing water samples collected in Nansen bottles. Below, this is how the SOFAR signal looks when picked up on the tape by the receiver. Note the sharp peak and abrupt drop





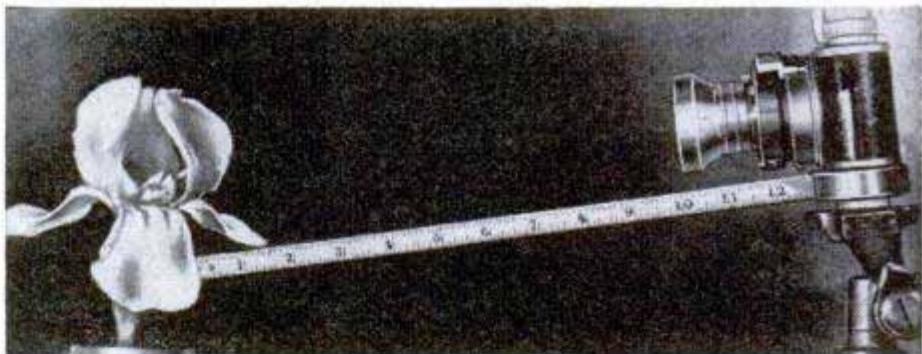
Identification Numbers Printed on Negatives

Negatives can be marked with identification numbers automatically during exposure to prevent errors in filing and print-

ing. Marking is done by a special camera back that fits any 8 by 10 or 5 by 7 studio or view camera. Dials on the back can be set to any number up to 9999. When the negative is exposed, the key number is printed on the margin of the negative.

Measuring Tape Mounts on Tripod

Mounted between the tripod head and the camera, a steel rule provides a quick and accurate means of measuring distances when making extreme close-up photographs with supplementary lenses. On the side of the case which contains the rule is etched a table giving conversion data for various supplementary lenses. By measuring the distance between the lens and subject and then referring to the table, the photog-



rapher learns where to set the camera focusing scale to be sure of sharp negatives. One side of the case has a screw that fits the tripod socket of the camera and the other side has a socket for the tripod.



Leash on a Reel Rewinds Itself

Dogs that have to be tied up are given considerable freedom by a leash on a self-winding reel. An 18-foot leash has a tension of slightly over one pound, not enough to hamper the dog's movements. The reel takes up or pays out the leash as the pet moves around.

Combination Lamp and Easel Gives Lighted Work Area

Drawings or photographs that require retouching are held at a convenient angle by a combination lamp and easel which provides a well-lighted working space. Practical for those who read in bed, the 10 by 12-inch easel surface holds a book or magazine upright and the adjustable shade insures adequate lighting without glare from the pages. The easel can be locked in any position from horizontal to almost vertical.

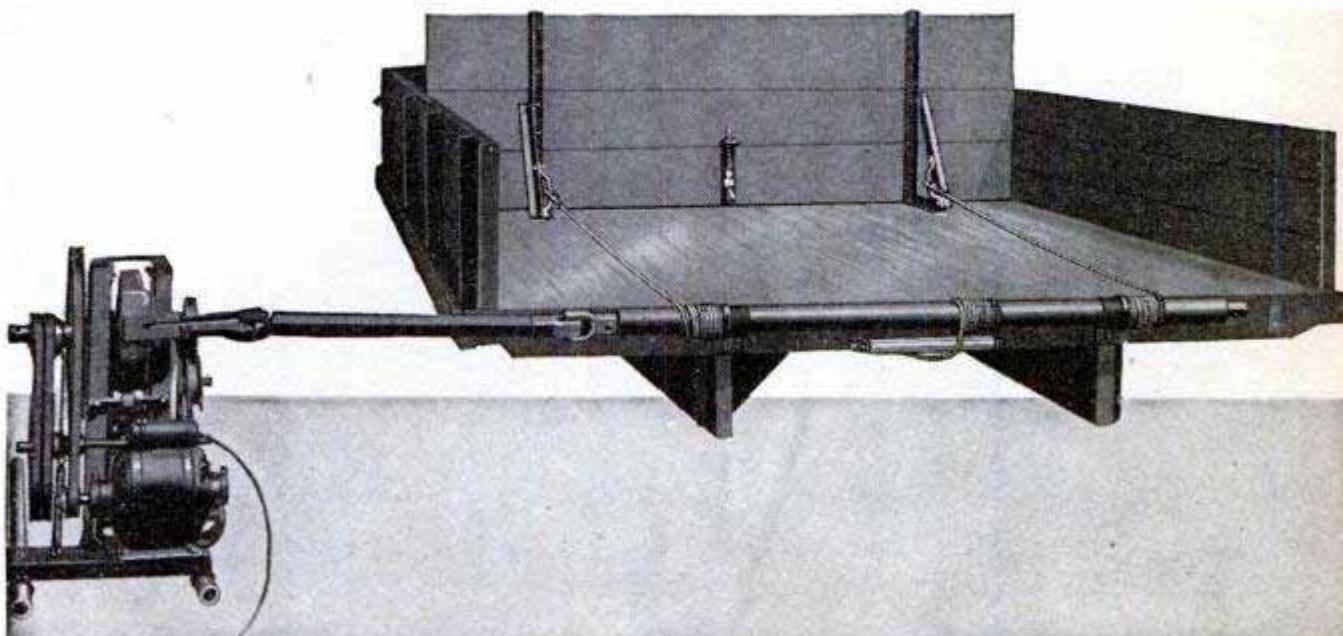


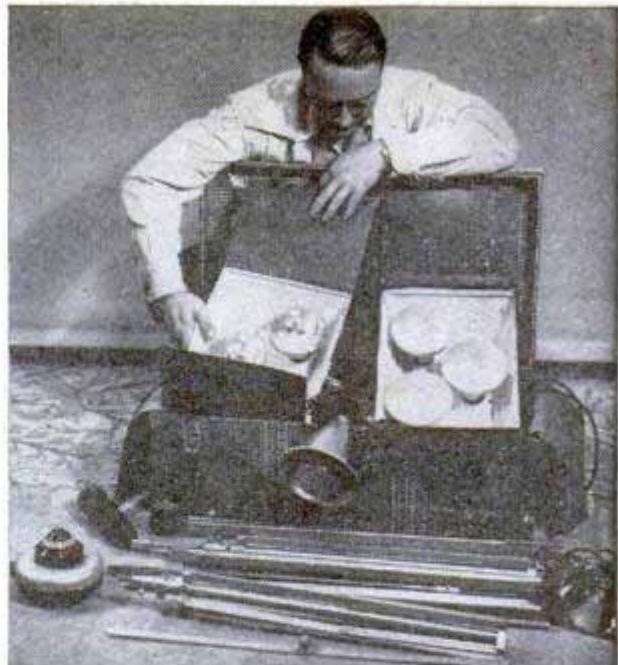
Four Tons of Chopped Hay Unloaded in Eight Minutes

Four tons of chopped hay can be unloaded in three to eight minutes by a self-unloading wagon box that is powered by a $\frac{1}{2}$ -horsepower electric motor. A speed

reducer gears the motor down to provide tremendous power at low speeds. The power unit is placed on the ground beside the tail gate of the wagon and power is transmitted to the cable take-up shaft by a telescoping drive shaft. Two cables pull a false tail gate to the rear of the wagon, spilling the load. A third cable returns the tail gate to the front end of the wagon box in six seconds when unloading is completed. Any number of wagons can be used with one power unit. The telescoping drive shaft makes uncoupling easy.

Left, false tail gate shoves a load of green field grass out of the truck while workers load it into a silo. Below, the tail gate is pulled to rear by cables connected to an electric motor





Portable Lighting Kit for Movie Photographers

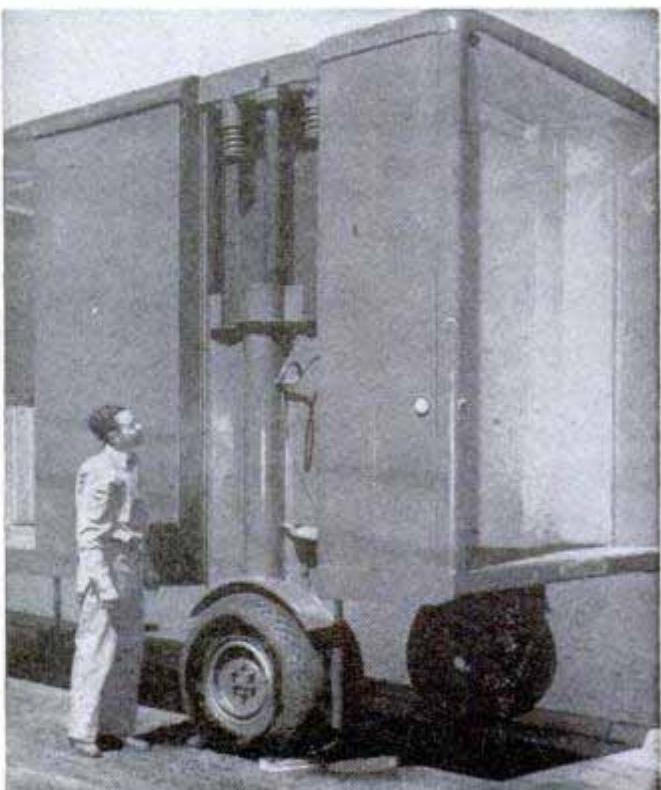
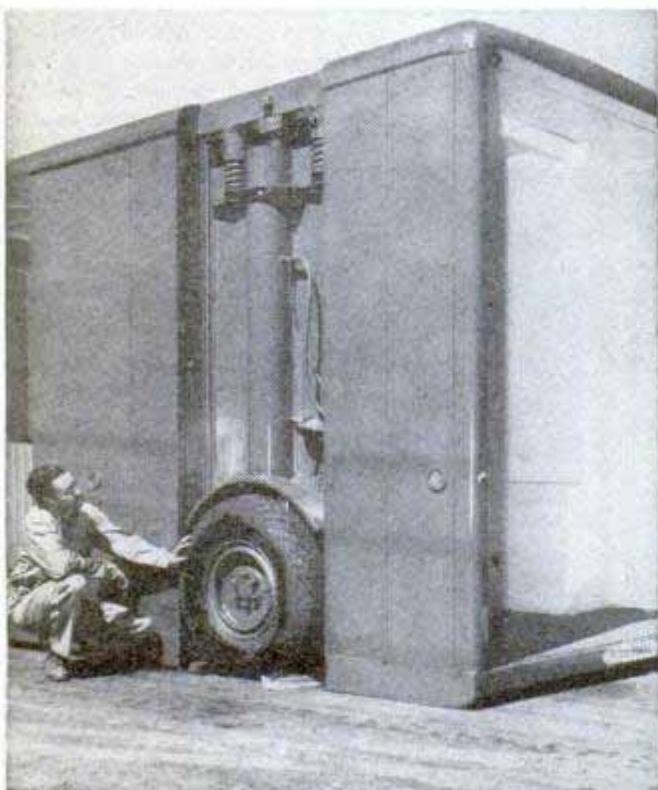
Designed to pack in one suitcase, a complete lighting set allows the amateur to take brilliant indoor movies wherever ordinary house current is available. When used with a special step-up transformer, the lights provide as much illumination as a dozen No. 12 photoflood lamps. With the

transformer, the lights can be used on a 15-ampere circuit without danger of blowing the fuse. Two floodlights, each containing three lamps, one boom light and a clamp-on spotlight are included. Collapsible standards and an automatic reel with a capacity of 15 feet of cord are also included.

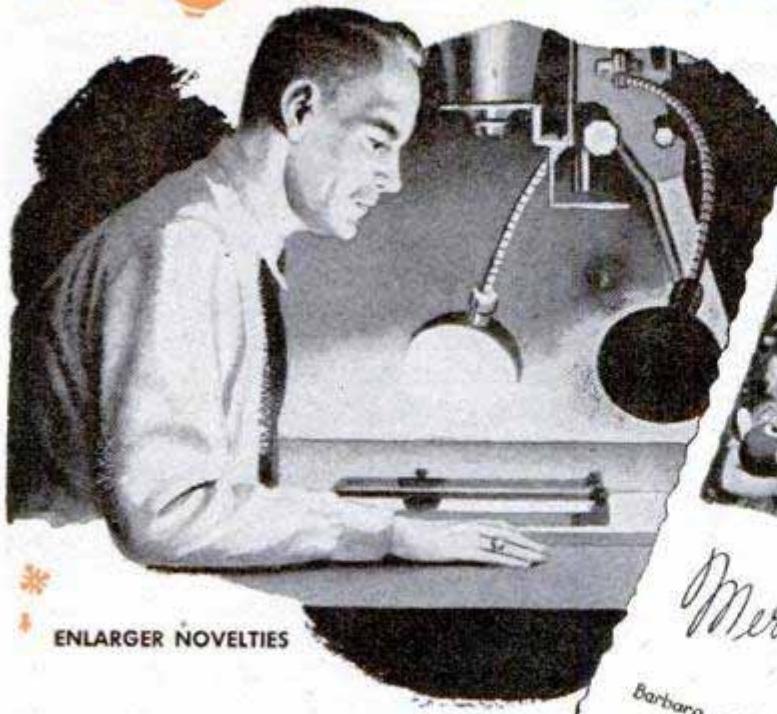
Trailer Goes Up or Down to Match Loading Dock

Loading and unloading big trailers are speeded by a hydraulic wheel-suspension system that enables the operator to raise or lower the trailer bed to match the height of the loading dock. If desired, the trailer can be lowered all the way to the ground.

Similar to the retractable landing gear of an airplane, the suspension system is hydraulically operated. A pump, driven by a small gasoline engine, powers the system. Each wheel can be adjusted separately through a distance of 53 inches.

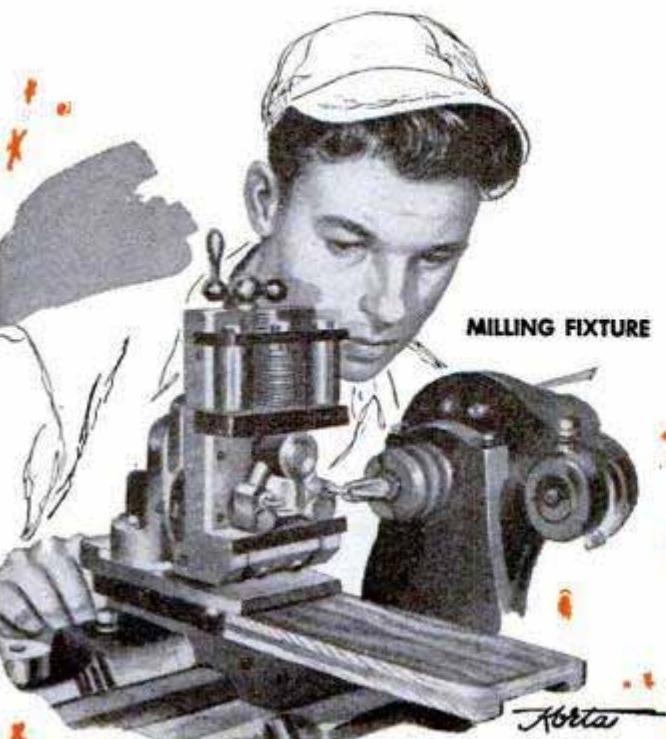


The CRAFTSMAN

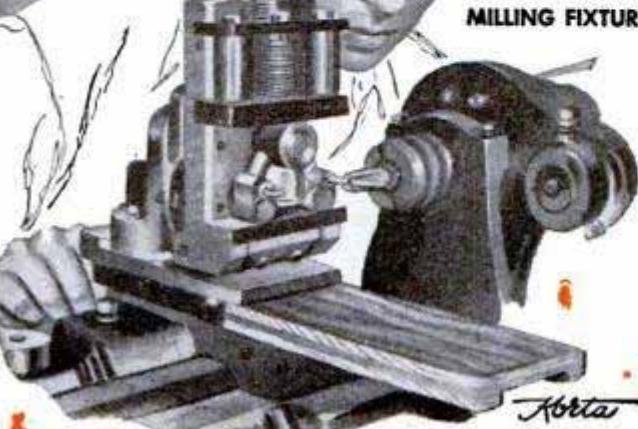


ENLARGER NOVELTIES

Using your photo enlarger to make personalized greeting cards is a way of saying "Merry Christmas" with a spirit and meaning appreciated by friends everywhere. Procedure is fully described on page 208. This month the home-repair series covers the care and servicing of house doors—how to correct sagging doors, how to adjust locks and hinges, and so on, page 194. Two shop stories of interest to craftsmen are motorizing and modernizing an old treadle-type sewing machine, page 174, and building a lathe milling fixture, page 220. Special-interest feature of the milling fixture is that the machine work is done on the lathe on which fixture is to be used



MILLING FIXTURE



MODERNIZE YOUR
SEWING MACHINE .



DOOR REPAIR



OLD TO NEW

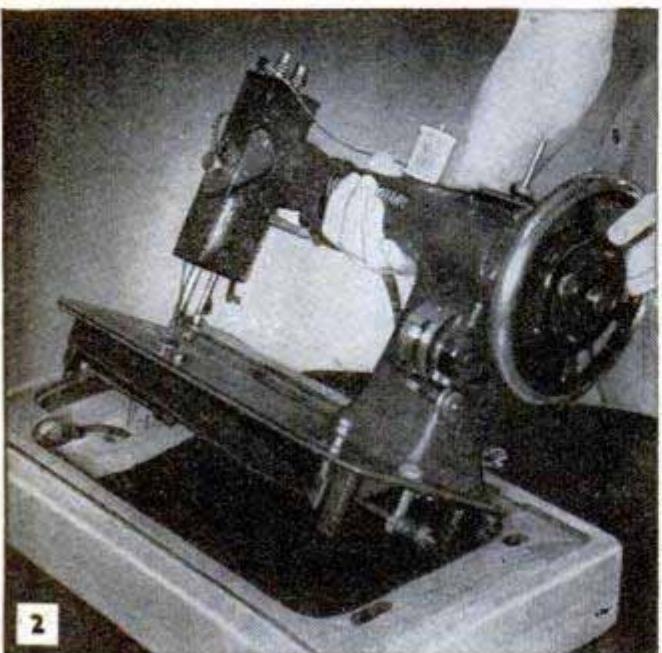
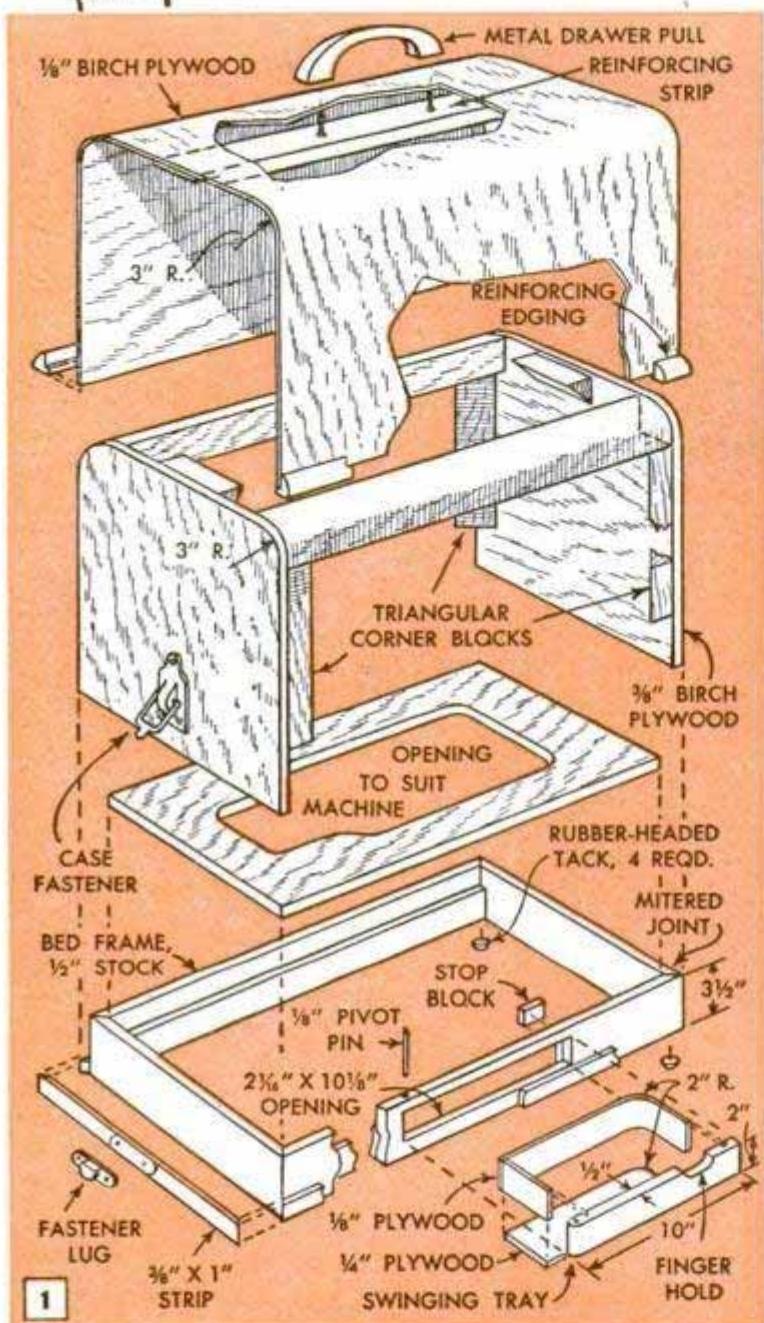


By J. W. Rocke and M. C. Anderson

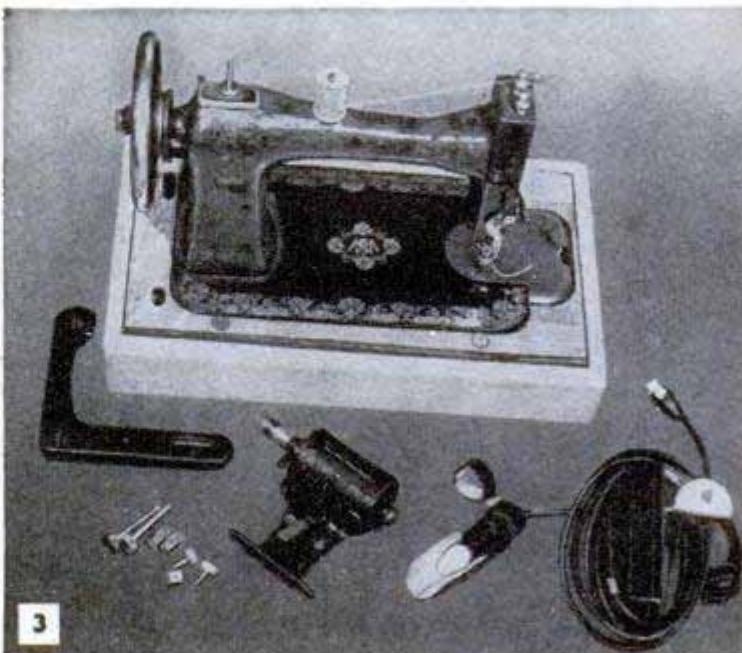
USING conversion kits now available, you can electrify that old treadle sewing machine and then make it over into a modern portable type by fitting the sewing head into an attractive cabinet. Almost any old sewing-machine head that is still in serviceable condition will do.

First remove the head from the cabinet and determine the over-all size of the mounting board, or base, to which the head is hinged. On some old machines the mounting board is in two parts. In this case, a new mounting board will have to be fitted. If it is necessary to make this part, use oak or birch plywood so that it can be finished attractively. Next, by measuring the sewing head, determine the required depth of the cabinet base, or bed frame, Fig. 1. This is given as $3\frac{1}{2}$ in., which is average, but you may have to change this dimension. Then measure the sewing head for over-all height, length and width. These dimensions, plus an allowance for clearance all around, will give you the inside dimensions of the cabinet hood.

Figs. 2, 3 and 4 show the cabinet base partly completed and the machine mounting board being fitted. As detailed in Fig. 1, an offset is formed all around the inside of the base on which the mounting board rests when the head is in position. If you have the necessary equipment,



2



3

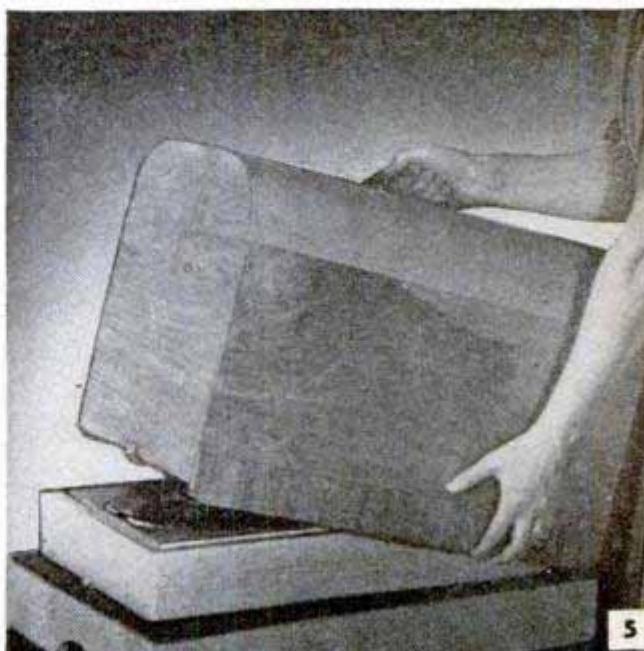
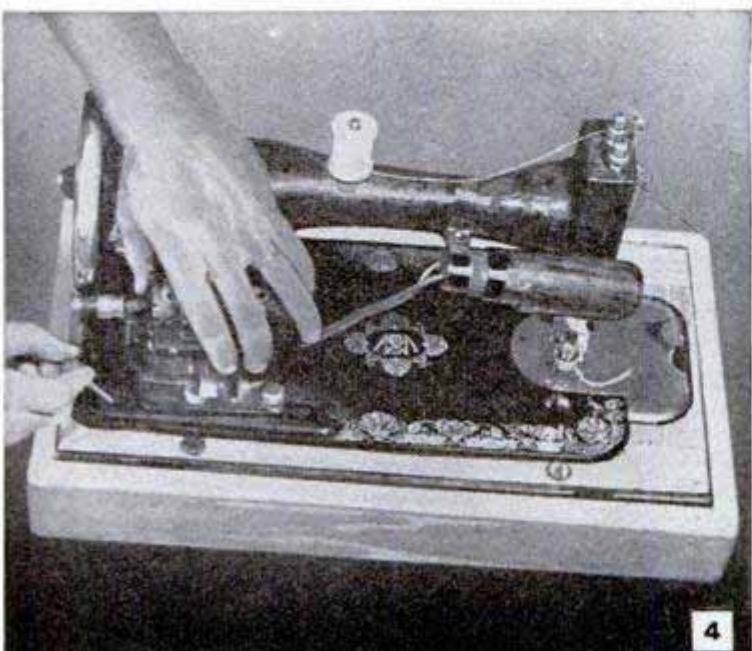
Sewing-Machine Conversion

the extra pieces which form the offset can be omitted and the upper edges of the sides and ends rabbeted instead. The swing-out tray is optional. On some types of sewing heads it is not possible to install the tray unless the base is made deeper so that the tray will clear when closed. The endpieces of the cabinet hood are cut from $\frac{3}{8}$ -in. plywood with a 3-in. radius at the upper corners. If desired, the hood can be made with a fully rounded top instead of the flat top detailed. The end panels are glued and bradded to the spreaders. Triangular corner blocks are glued flush with the edges of the endpieces at the top and sides. Then the plywood covering is dampened at the points where it will take the bends and is bradded and glued in place. After the glue is dry, set the heads of the brads below the surface and fill the holes with a wood filler. Install a reinforcing strip of hardwood under the point where the carrying handle will be attached, as in the upper detail, Fig. 1. Attach the handle with screws driven up from the underside of the hood through the reinforcing strip.

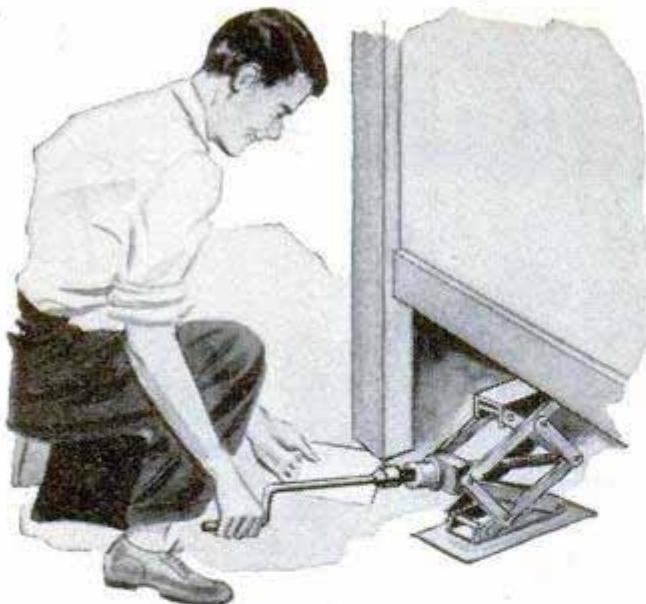
Now, make a trial fit of the hood as in Fig. 5. It should fit over the bed frame without binding. This determined, glue rabbeted strips to the bottom edges of the hood to protect the edges of the thin plywood. These strips match the $\frac{3}{8} \times 1$ -in. strips glued to the outside of the bed frame,



as in the lower detail, Fig. 1. Varnish all exposed parts in the natural color of the wood. If birch or other close-grained hardwood is used, no stain or filler will be necessary. Instructions supplied with the motor kit, Fig. 3, will indicate clearly how to install and operate the unit. Have the kit on hand before building the hood so you can make allowance for hood clearance.



Scissors Jack Aids Leveling Bench

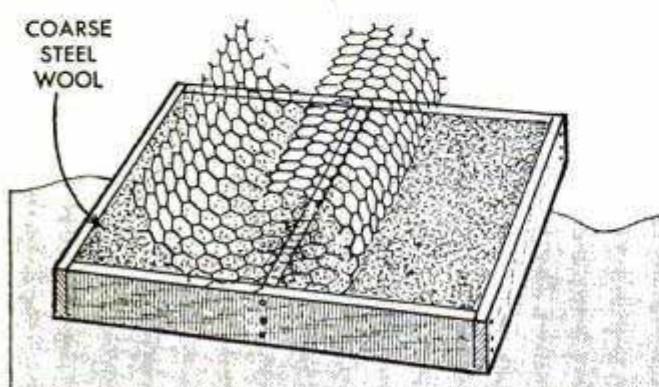
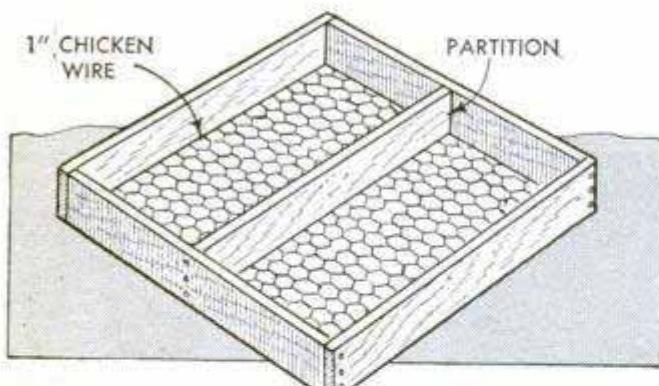


Little effort is required to level a heavy lathe stand or workbench if the legs of the table are raised with a scissors-type car jack. The jack is slipped under a side or end rail near the leg to be shimmed.

Robert Hertzberg, Jackson Heights, N.Y.

Filter for Warm-Air Furnace Has Steel-Wool Packing

Instead of buying a new filter for my warm-air furnace periodically, I made an inexpensive one which can be cleaned easily and will last indefinitely. It consists of a wooden frame 2 in. deep, having the same over-all dimensions as the original filter. A wooden partition nailed across the frame divides the filter into two sections to sim-

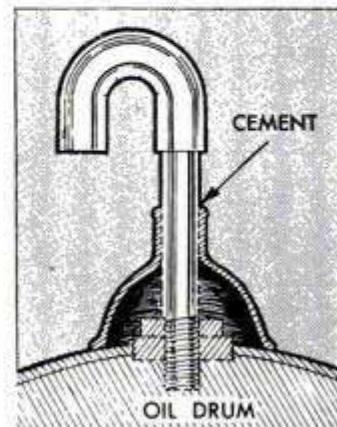


plify cleaning. Each section is packed with one pound of coarse steel wool which is held in place by tacking 1-in.-mesh poultry wire over both sides of the frame. To clean the filter, simply remove the steel wool and wash it in kerosene, allowing it to dry before replacing. The efficiency of the filter can be increased by sprinkling a small amount of lightweight motor oil over the steel wool.—R. Boettigner, Englewood, N.J.

Suction Cup Over Oil-Drum Plug Prevents Water Leakage

Water seeping into outdoor fuel-oil drums can be prevented by fitting the suction cup from a drain plunger over the vent pipe. This will keep water from entering between the threads of the bung and the filler plug. The cup is located on the pipe so it fits snugly against the drum when the plug is screwed into the bung. A little gasket cement applied around the neck of the suction cup will stop water from seeping in around the vent pipe.

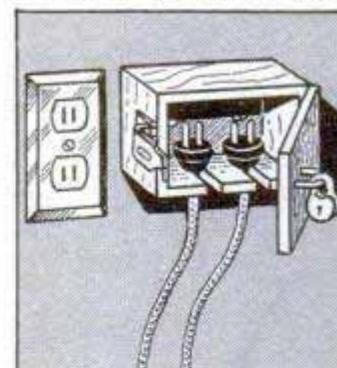
Glenn R. Uhlmann, Bremerton, Wash.



Safety Box Holds Power-Tool Plugs

To keep inquisitive children from turning on his power tools, one home craftsman inserts the extension-cord plugs in a padlocked safety box. The latter is a small wooden box fastened to the wall near the receptacle. Slots in the bottom of the box admit the cords, and the size of the plugs prevents them from being pulled through the slots. Box is mounted near wall outlet.

Sidney Abbot, San Francisco, Calif.

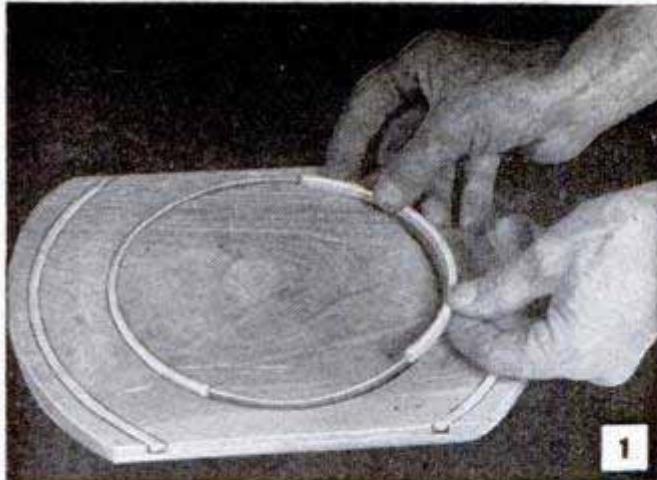


Salt Eliminates Snow Shoveling

Try sprinkling salt over your walks and driveway as soon as it begins to snow. The salt will melt the snow as it falls and save you the work of shoveling.

Hubert H. Wehner, Saginaw, Mich.

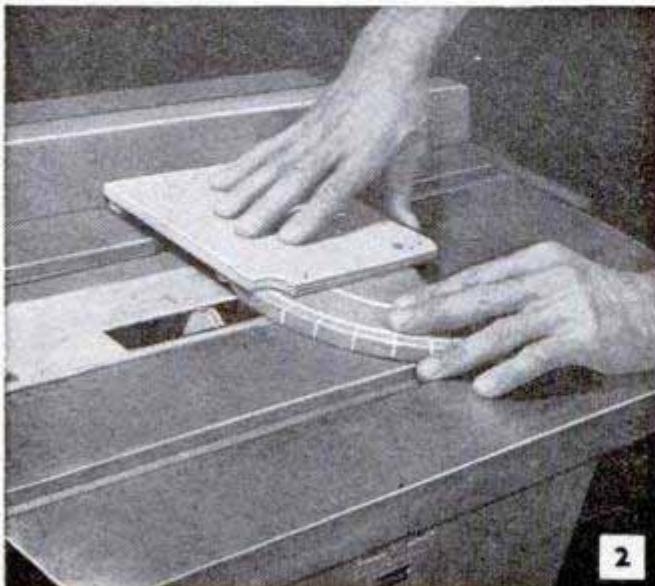
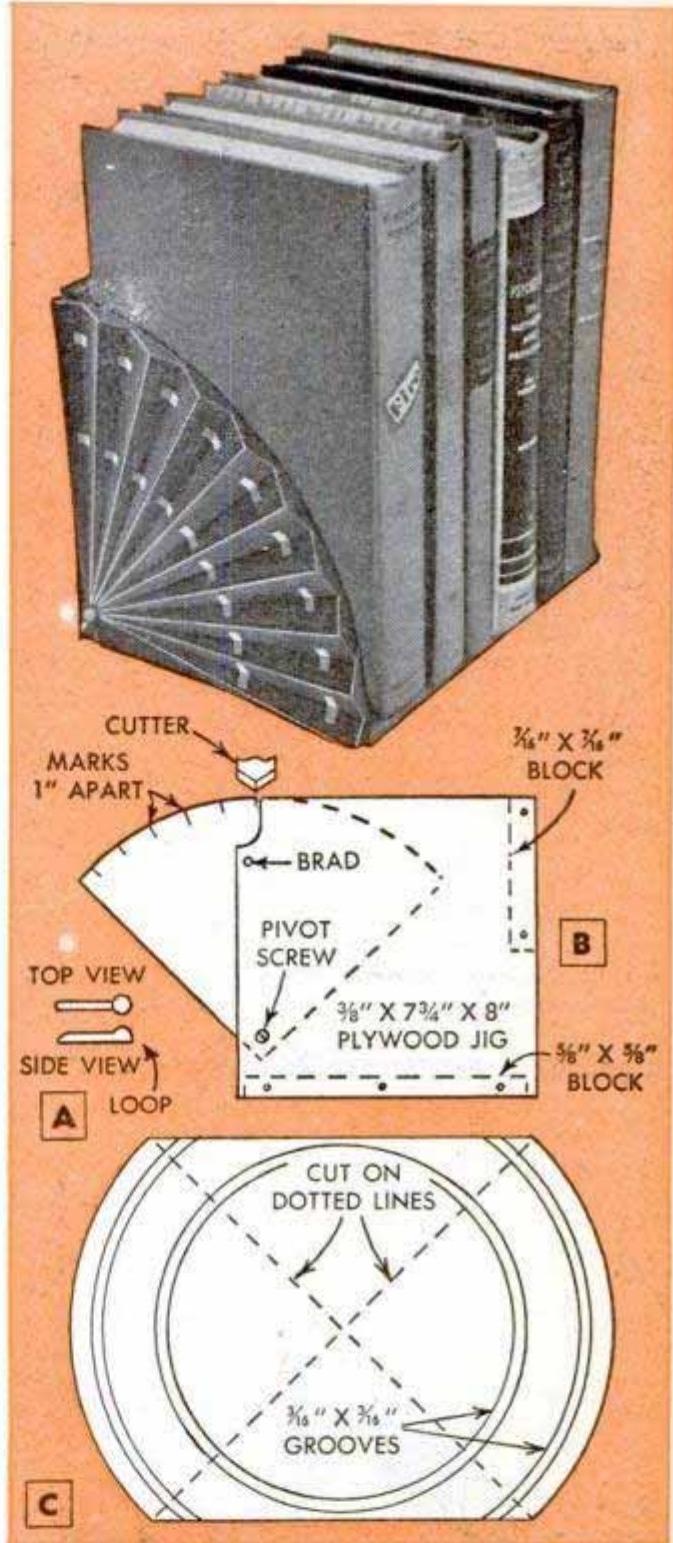
Pork fat will render more quickly if it is first run through a food chopper.



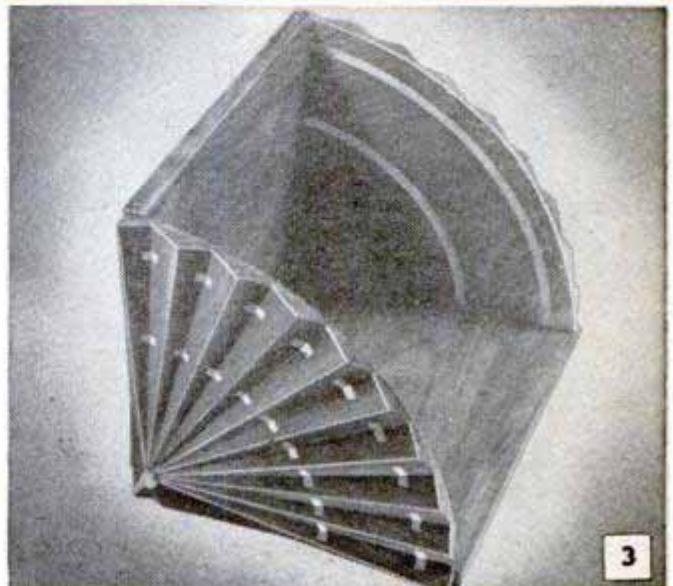
1

FAN BOOKRACK

GOOD DESIGN, usefulness and ease of construction — these features are the measure of a wood novelty such as this fan bookrack. The fan design is relieved by means of wide V-cuts which expose a contrasting inlay simulating the fan lacings. Begin by making the piece shown in detail C at the right. This piece is $\frac{1}{2}$ in. thick, 9 in. wide and 12 in. long and the ends are bandsawed on an 8-in. radius. Lathe-turn grooves in the piece and inlay with a contrasting wood as in Fig. 1. Then cut on the dotted lines, detail C, and make the fixture shown in detail B. Now, grind straight molding cutters to the wide V-shape required and set up to shape the endpieces on the circular saw as in Fig. 2. After running the shaping cuts, rabbet the straight edges of the endpieces to take the bottom and back of the rack. These parts are of $\frac{3}{8}$ -in. stock. Finish all parts in the natural color before assembling. Finally, fit the simulated fan loop at the lower corners of the endpieces. See detail A and also Fig. 3. These parts should be made from the same contrasting wood as the lacing inlays and are finished in the natural color.



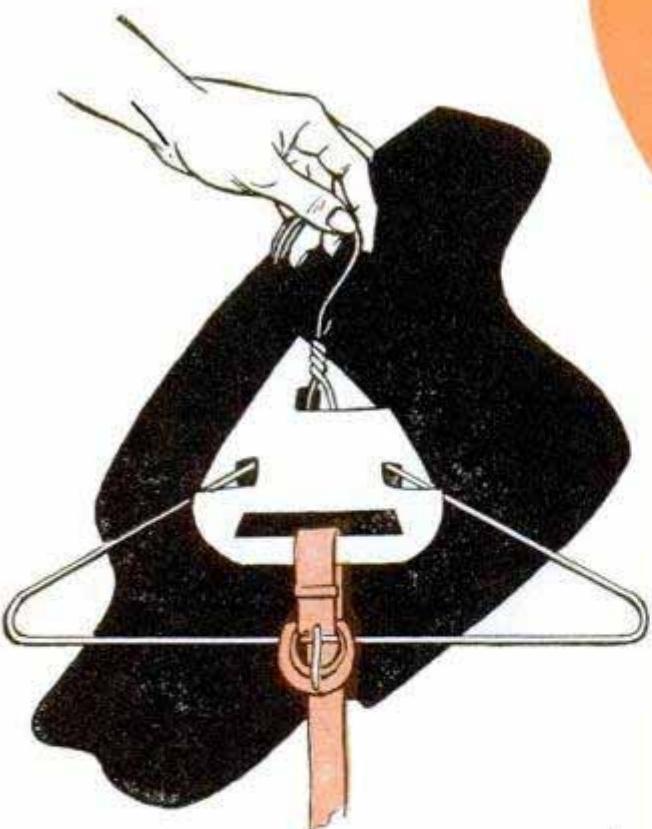
2



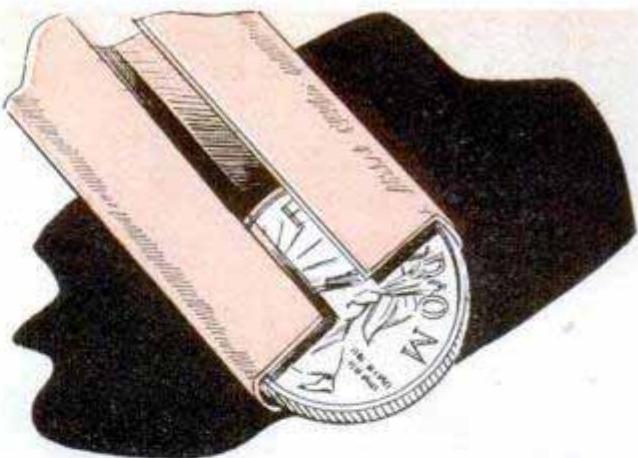
3



FOR DRYING SWEATERS, mittens and other soft, hard-to-dry garments, cut the top off an old card table. Cover the frame with plastic screen stretched tightly and tacked

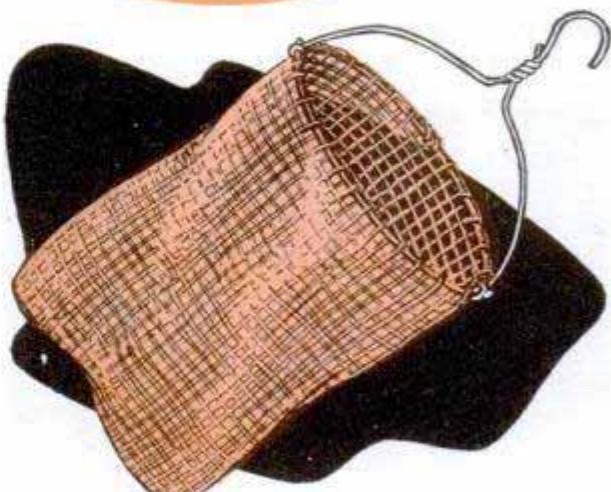


SIMPLE BELT HANGERS are made from cardboard to fit over a wire clothes hanger for storing matching belt with a suit or skirt. Note that square openings are cut in the cardboard and slits are made from bottom corners of the openings to the edges

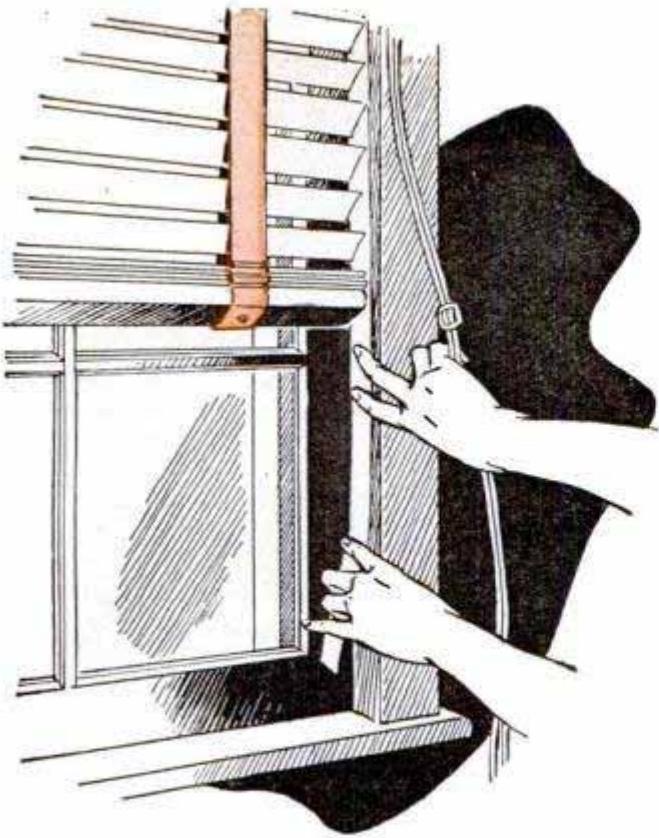


OPEN-MESH CURTAINS slip easily over sections of flat, telescoping rods when you wedge a coin into the end of the larger rod section. The contour of that portion of the coin which projects prevents snagging of the soft, open-mesh material

SOLVING HOME PROBLEMS



THIS CLOTHESPIN BAG is especially handy because the top is held open by a hoop made from a wire clothes hanger. Use another hanger to make the hook bail for supporting the bag on the clothesline. Sew an onion sack to the hoop and there you are



WINDOW STOPS won't get nicked, scratched or soiled when cleaning Venetian-blind slats if you protect them with painter's masking tape. This is placed over face of the stop as shown. The same pieces of tape are stripped off and reused a number of times for this purpose before discarding

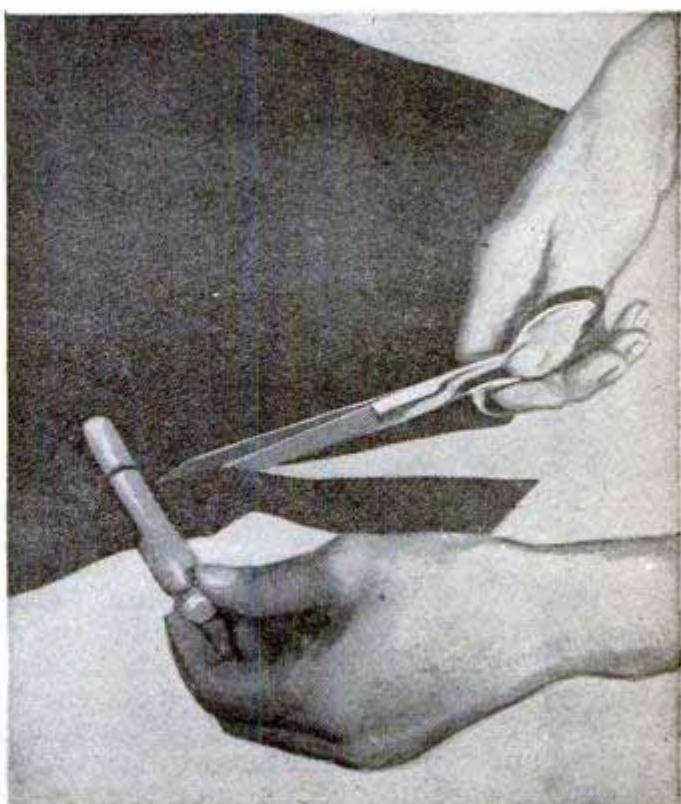


WHEN UPHOLSTERING chair seats or footstools with needle-point it's a good idea to place a piece of oilcloth under the floral design. Then, when sponging the design to clean and brighten it, the oilcloth will protect the padding underneath from absorbing moisture. Size of the oilcloth is determined by the size of the design



GRATING CHOCOLATE uniformly fine so it melts quickly without scorching is done in a jiffy with an ordinary potato peeler. By varying the angle at which the peeler is held, the size of the chocolate particles can be made large or small as desired

AN ORDINARY WOODEN CLOTHESPIN makes a good marking gauge for cutting strips on the bias from heavy fabrics. Mark one leg of the clothespin as shown below to give the width of the bias strip which is required. Then slip the clothespin over the edge of the cloth and slide it along the edge as the cutting progresses



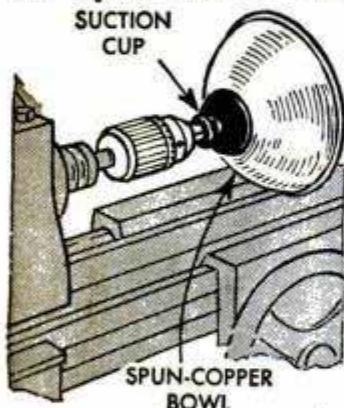
Finger-Pressing Wet Garments Facilitates Ironing



Instead of hanging dresses, blouses and similar garments out to dry, wrap them in a turkish towel to absorb excess water and then hang them on a clothes hanger. Press the garments evenly and firmly on the front and back with the fingers, fasten all buttons and close all the zippers. Then hang the garment in a suitable place to dry and finger-press again while it is still slightly damp. When the garment is dry, it will require very little ironing.

Helen Lemberger, Chicago.

Suction Cup Chucks Copper Bowl To Spin-Polish the Inside



With the aid of a suction cup, a tarnished spun-copper bowl can be easily mounted in a metal-turning lathe to facilitate polishing the inside. A nut embedded in the cup is turned tightly on the threaded end of a length of $\frac{1}{2}$ -in. rod which, in turn, is chucked in the lathe drill chuck. If the suction cup used is the type having a machine screw embedded in the rubber, the end of the rod is drilled and tapped to receive the screw. The bowl is carefully centered on the suc-

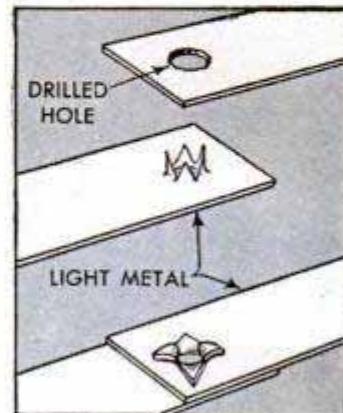
tion cup to avoid vibration and, with the lathe running at moderate speed, the inside of the bowl is quickly polished with steel wool or abrasive cloth. The suction cup will not mar the highly-polished outer surface of the bowl, and a firm grip can be assured by coating the edge of the cup with glycerin or soap.

Alfred D. Beavin, Fair Haven, Vt.

Joining Sheet Metal Without Rivets

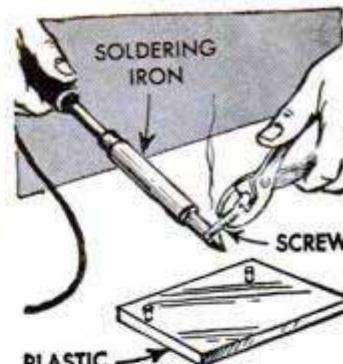
Pieces of light-weight sheet metal can be joined tightly without riveting or soldering. First drill a $\frac{1}{8}$ -in. hole through one of the pieces and remove the burr with a file. Then make a registering hole in the other piece of sheet metal by driving the pointed end of a center punch through it. The jagged burr formed around the punched hole is passed through the hole in the first piece, and then the prongs are hammered over the edges of the hole.

Herbert E. Fey, New Braunfels, Tex.



Tapping Holes in Plastic

By using the threads of a proper-sized screw as a tap, holes in plastic parts can be threaded quickly. Drill the holes slightly undersize and heat the threaded portion of the screw with a soldering iron or over an open flame. Then turn the screw into the hole to cut the threads in the plastic.—Harold Pallatz, Brooklyn, N. Y.



Upholstering Nails Driven Neatly With Aid of Rivet Set

The problem of driving upholstering nails without damaging the heads can be solved by using a large rivet set. The nails are driven part way with a hammer and finished with the set.





By
Benj. Nielsen

Interlocking WASTE BASKET

Painted in traditional red or black and decorated in gold, this intriguing Chinese wastebasket, with its interlocking corners, makes you wonder how it fits together. It consists of 18 slats, $5/16$ in. thick, 14 of which are made 3 in. wide and four $1\frac{1}{2}$ in., all being notched as indicated in the half patterns shown. Note that 10 of the 3-in. slats are beveled on both edges, whereas the others are beveled on just one edge. The basket is built up by fitting a plywood bottom into grooves run on the inside of three of the bottom slats. When all slats are interlocked, the two top half slats are held with brads.

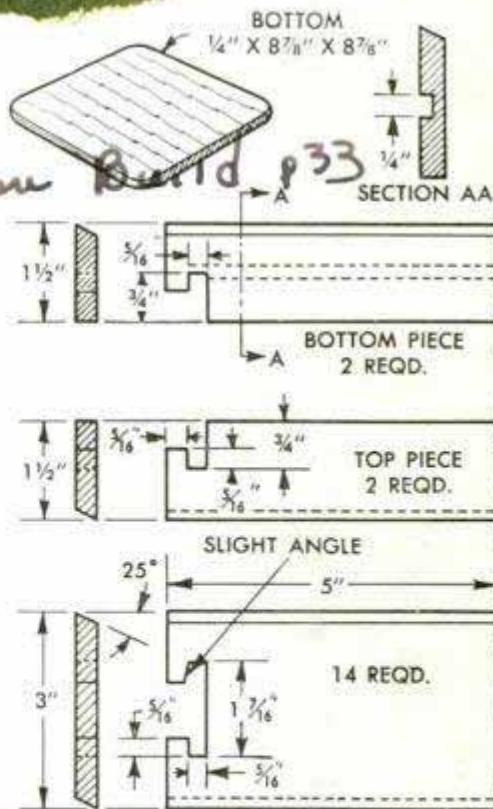
STACK-SAWING LOCKING CORNERS



HOW BOTTOM IS FITTED

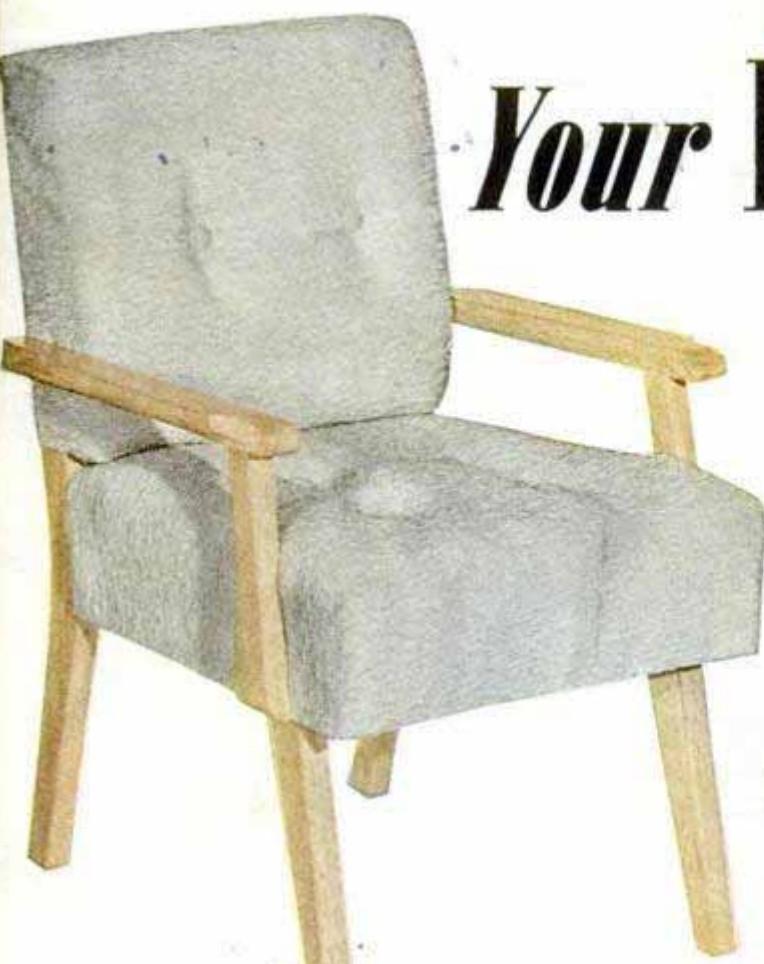


INTERLOCKING THE CORNERS





No need to be apprehensive about tackling the upholstering—simplified method makes it easy. Cushions are upholstered on separate frames and then screwed in place right in the chair. New sagless-type springs topped with pocketed coil units provide deep oversize cushions for real lounging comfort. Stock materials used



Your Living-Room





Furniture

Part II

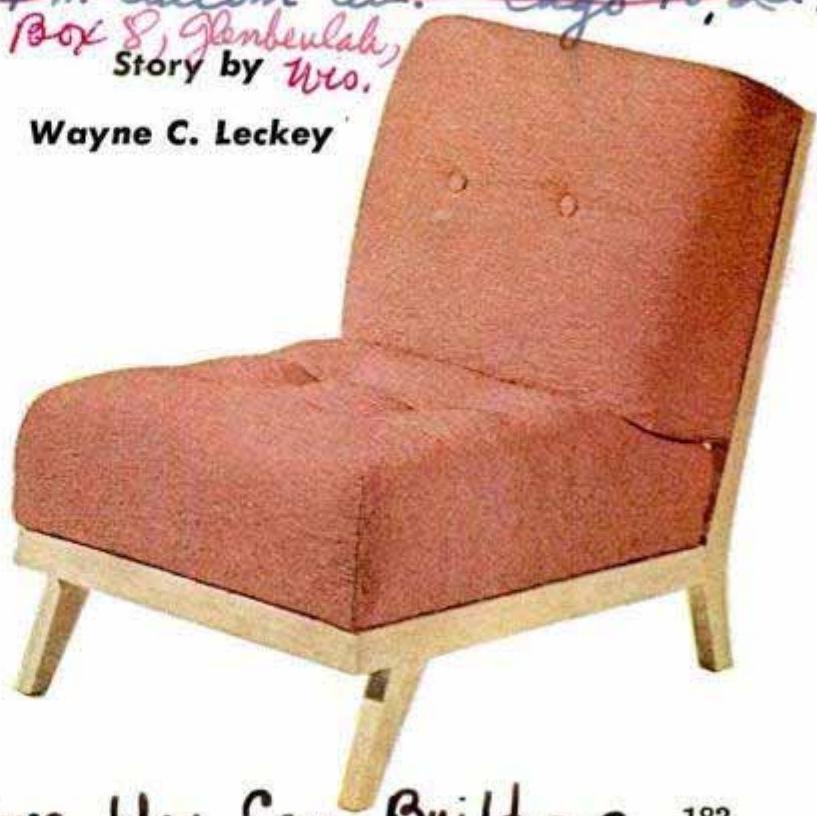
furniture hardware from:

Styled by John Bergen, noted furniture designer

~~3744 W. Cullom Ave. - Chicago 18, Ill.~~
~~PO Box 8, Glenbeulah,~~
Story by W.C.

Wayne C. Leckey

WITH THE cabinet pieces of the group completed as described last month in Part I, you can begin the sectional sofa and chairs. Normally, conventional upholstering that requires tying springs and sewing welt seams is a job for the experienced worker, but here, through the use of sagless-type springs and "box" cushions, the work is simplified to the point where an amateur can do a first-class job. The upholstered pieces of the group include a three-piece sectional sofa, an easy chair and a hostess chair, the latter being made with either wooden or padded arms. The two photos at the bottom of page 182 show how





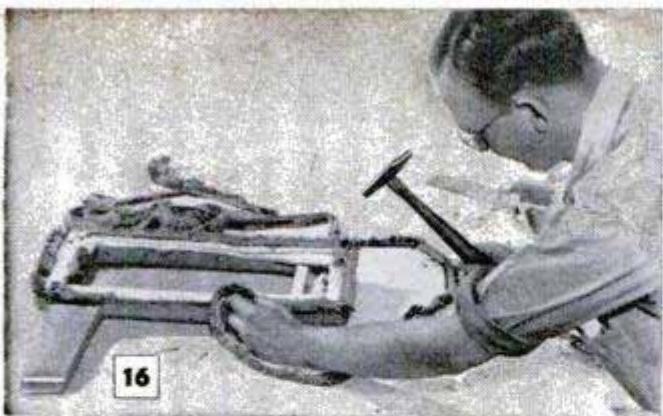
Here's how units of the sectional sofa can be used in conjunction with a living-room fireplace and cocktail table. End units of the sofa are placed together and the center unit is used opposite as a separate chair

the hostess chair will look in each case. Basically, the easy chair, shown at the top of the same page, is a duplicate of the sectional units, except that it is fitted with two arms. Seat and back cushions of each unit are built-up on separate frames which are then screwed to the chair frame. In the case of the hostess chair, the upholstering method differs in that the seat and back are sprung and padded right on the chair.

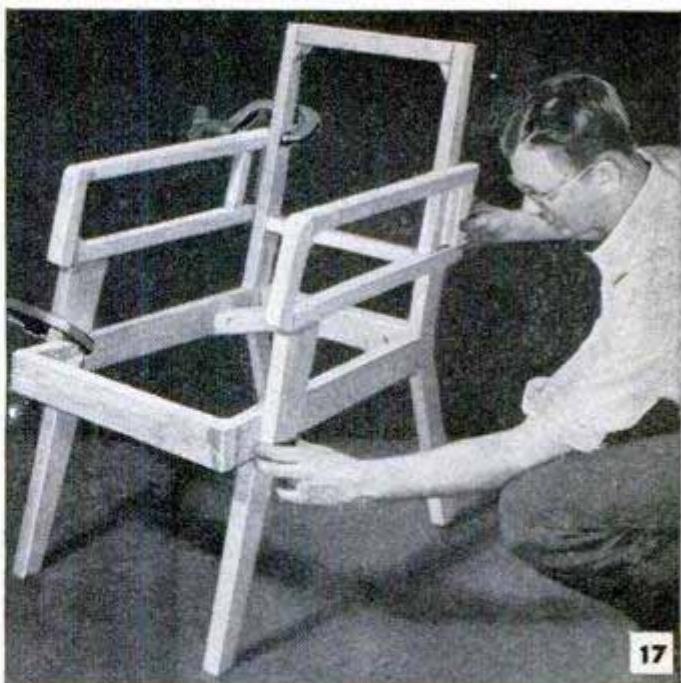
The sectional sofa is highly functional and can be arranged in a number of ways. Its individual units may be grouped around a corner table as pictured in Part I, or they may be used side by side and flanked with a pair of end tables as shown on the preceding page. Still another suggested arrangement is given in the photo above. Here, the two end units having the arms are placed together and the center unit is used as an individual chair. In addition to the upholstered pieces, Part II covers the construction of two distinctive lamps.

Frames for the sectional sofa, easy chair and the hostess chair are detailed in Figs. 18 to 22 inclusive. The original pieces were made of solid oak to match the rest of the furniture. Parts of the frames not exposed can be made of any scrap hardwood. Both end units of the sofa are made as pictured

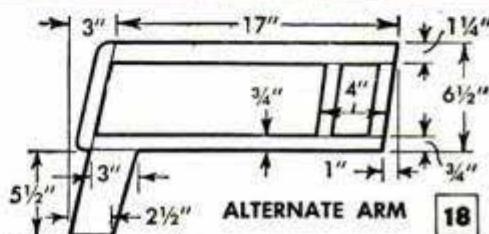
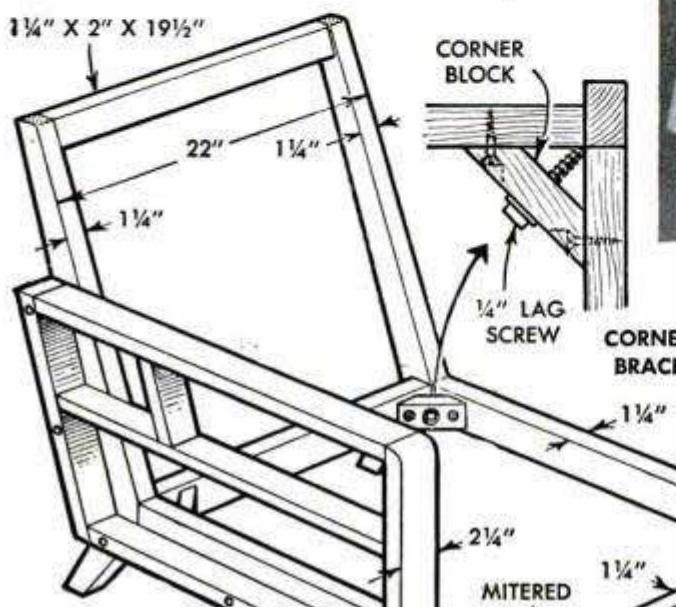
in Fig. 19, one being built with a right and the other with a left-hand arm. The center unit of the sofa, and the easy chair, are exact duplicates of the others, the center unit, of course, having no arms. Construction of the hostess chair, Fig. 21, is basically the same, differing primarily in size and the addition of a tacking rail across the back. As previously mentioned, this chair can be fitted with either wooden or padded arms. In both cases, the arms are made up separately and doweled through the holes in the fabric and into the frame after the upholstering has been completed. Then screws are driven into each arm from the inside. Fig. 18 details the framework for the padded arms and Fig. 17 shows them being trial-fitted, registering holes being made for the dowels. Note that the seat corner joints of all the frames are glued and doweled and then drawn up rigidly with lag screws. The front legs of the frames are half-lapped into the side rails, glued and screwed. The arms on the easy chair and the end units of the sectional sofa are screwed permanently to the frames before upholstering. Holes for the screws are counterbored through the width of the arms. When the frames are completed, all exposed surfaces of the chairs are sanded and finished as desired. The rear



16

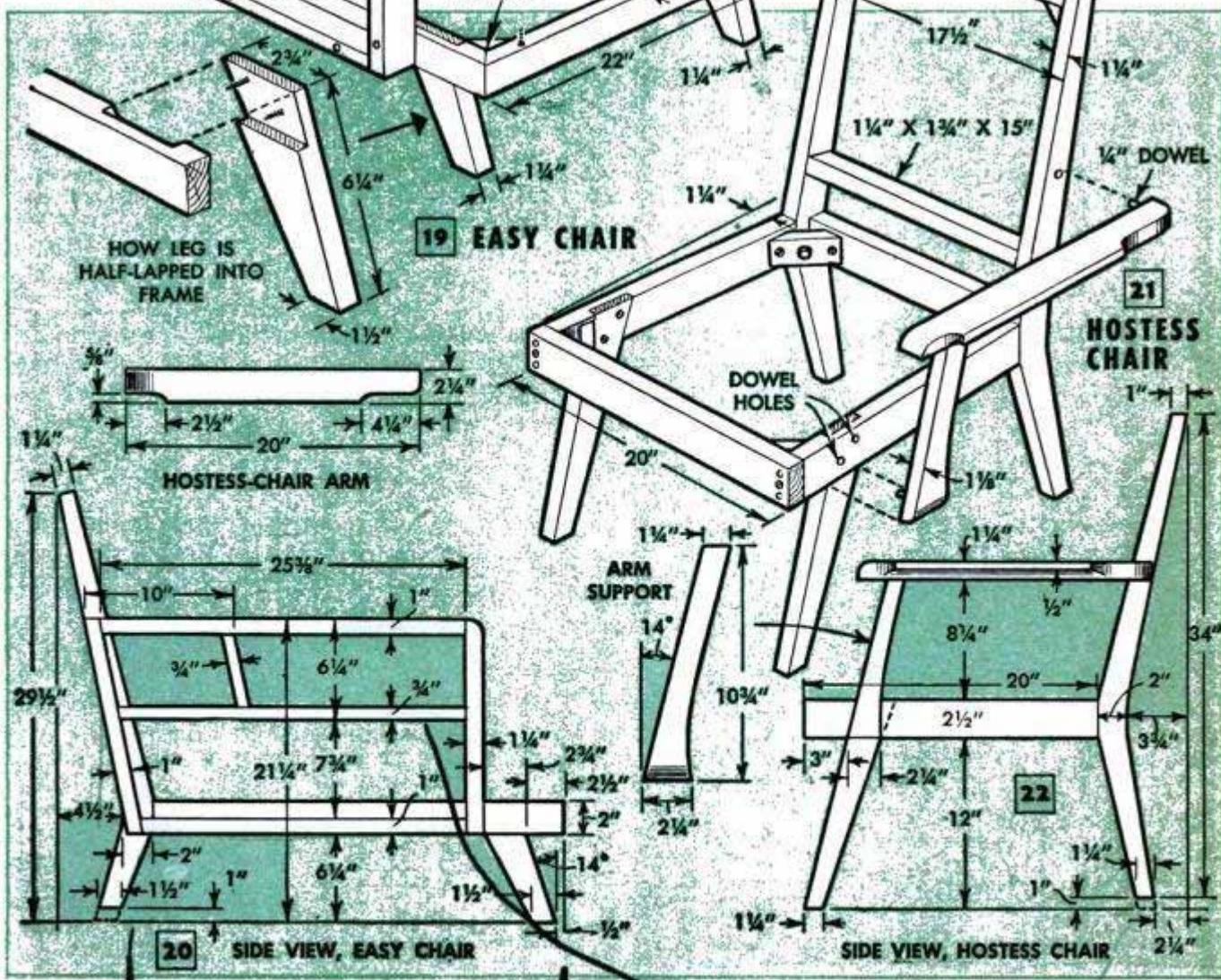


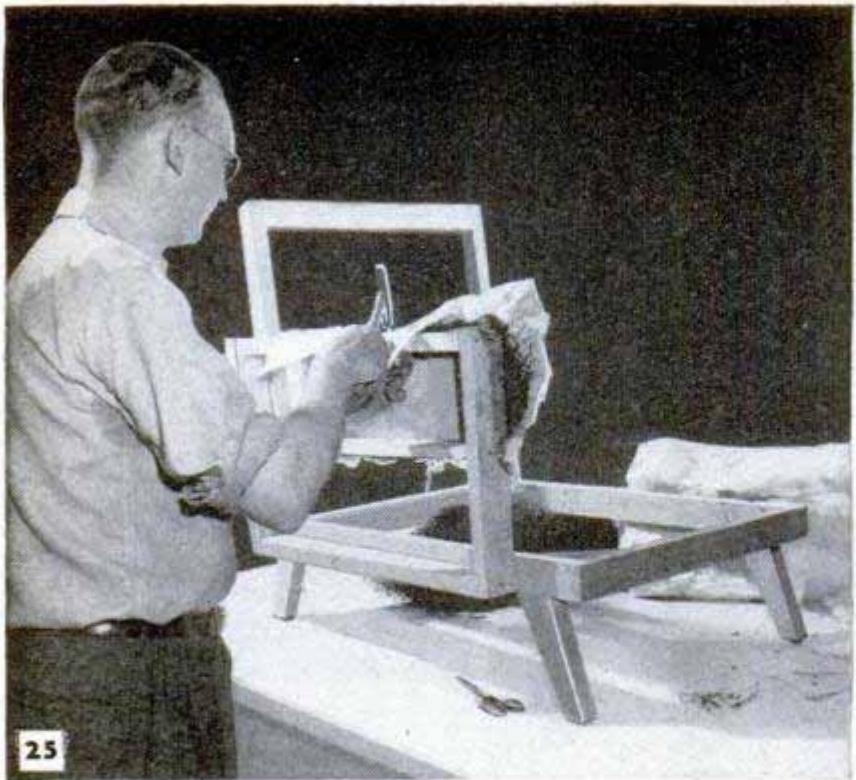
17



ALTERNATE ARM

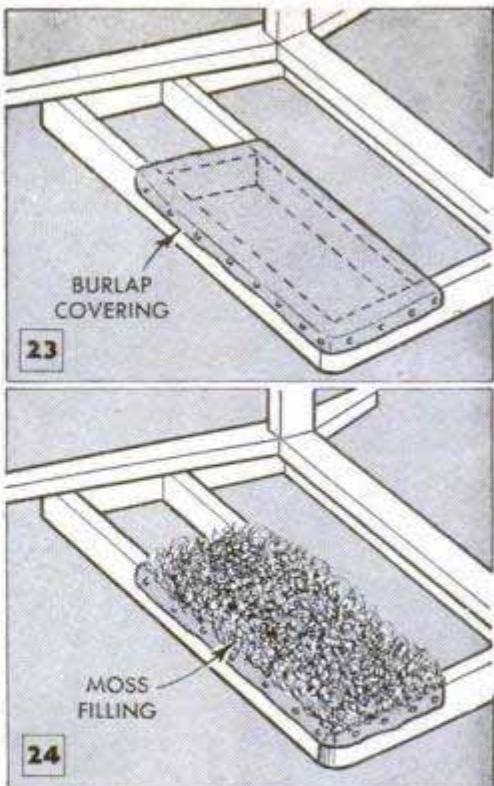
18





25

Above, this operation shows the padded arm of one of the sofa units being covered with muslin. Below, pocketed coil springs sold in strip form are sewed together to make up the required-size marshall unit



24

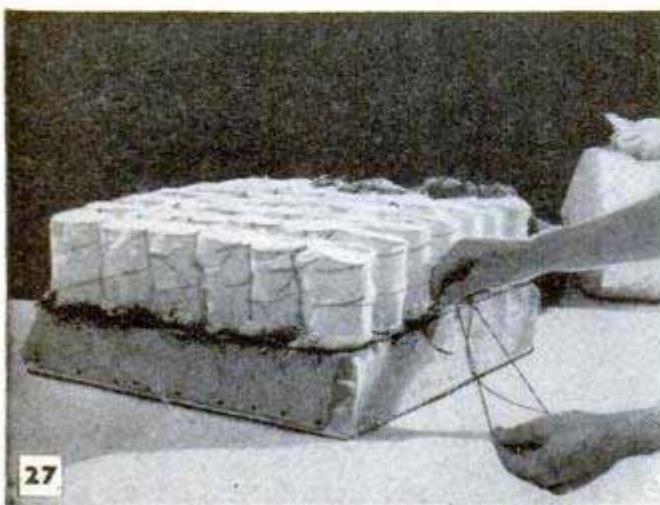


26

Below, the marshall unit is placed on top of the spring unit to which it is sewed around the four sides. Below, right, moss or tow filling is placed over marshall unit and then two layers of cotton

legs of the chairs can be cut off now to give the correct slant or after the units have been upholstered and tested.

Upholstering of the sofa units and the easy chair is done exactly alike. First, the arms are covered on the inside with burlap as in Fig. 23. Next, the burlap is padded with moss or tow filling which is held in place with long stitches through the burlap, Fig. 24, and then a layer of cotton placed over the filling is covered with muslin which is pulled firmly and tacked to the arm, Fig. 25. Edging material called "brush" is applied to the inside and outside edges of the arms. The details in Fig. 31 show how this is done. On the inside, the brush is tacked to the face of the arm on three sides so that it overhangs the padding. On the outside, the material is tacked to the edge of the arm on all four sides so it stands upright. The space around the edge of the arm between the brush trim is covered as follows. A piece of stiff cardboard long enough to reach around three sides of the



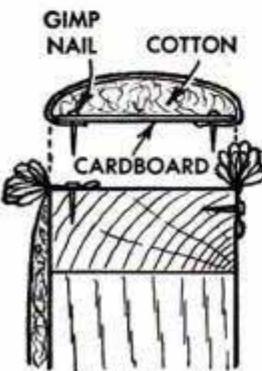
27



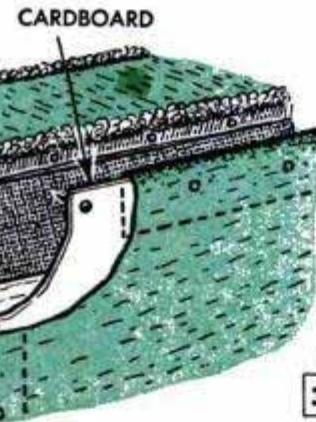
28

arm is padded with cotton and covered with fabric. Gimp nails are used to tack the strip in place, driving them along each edge and then concealing the heads by pulling the fabric up over them. This leaves the outside of the arm which is covered similarly with a cardboard panel, tacking it in the same manner as just described.

Cushions for the seat and back of the sofa and easy chair are built-up separately on flat hardwood frames, half-lapped at the corners, Fig. 32. The frames are made the same size as the over-all size of the chair frames. The seat frames require five, 8-ga. sagless-type springs, 26 in. long, while the back frames take five, 12-ga. springs 16½ in. long. The springs are anchored to the front and rear edges of the frame with special clips made for the purpose. These are first nailed to the wood and then crimped over the spring wire before renailing. Note that the ends of the springs are bent back to prevent them from slipping out of the clips. In all installations, it is



METHOD OF ATTACHING FABRIC TO SIDE OF CHAIR

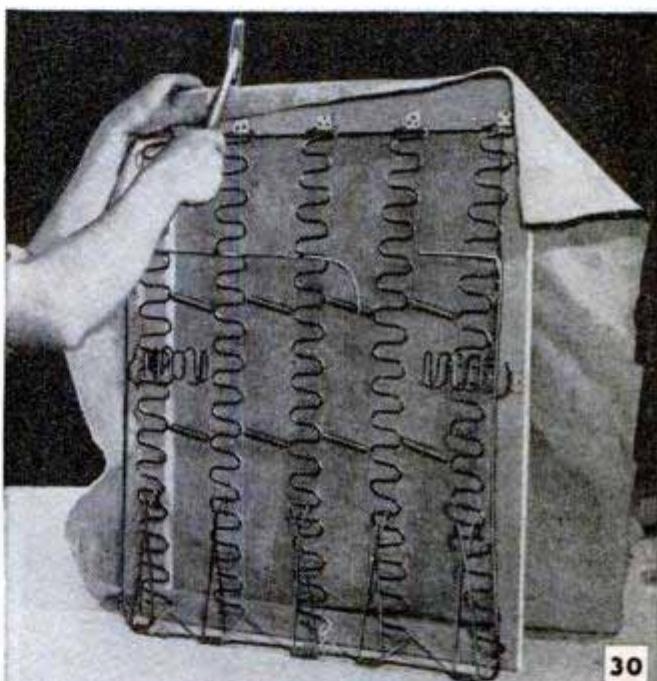


31



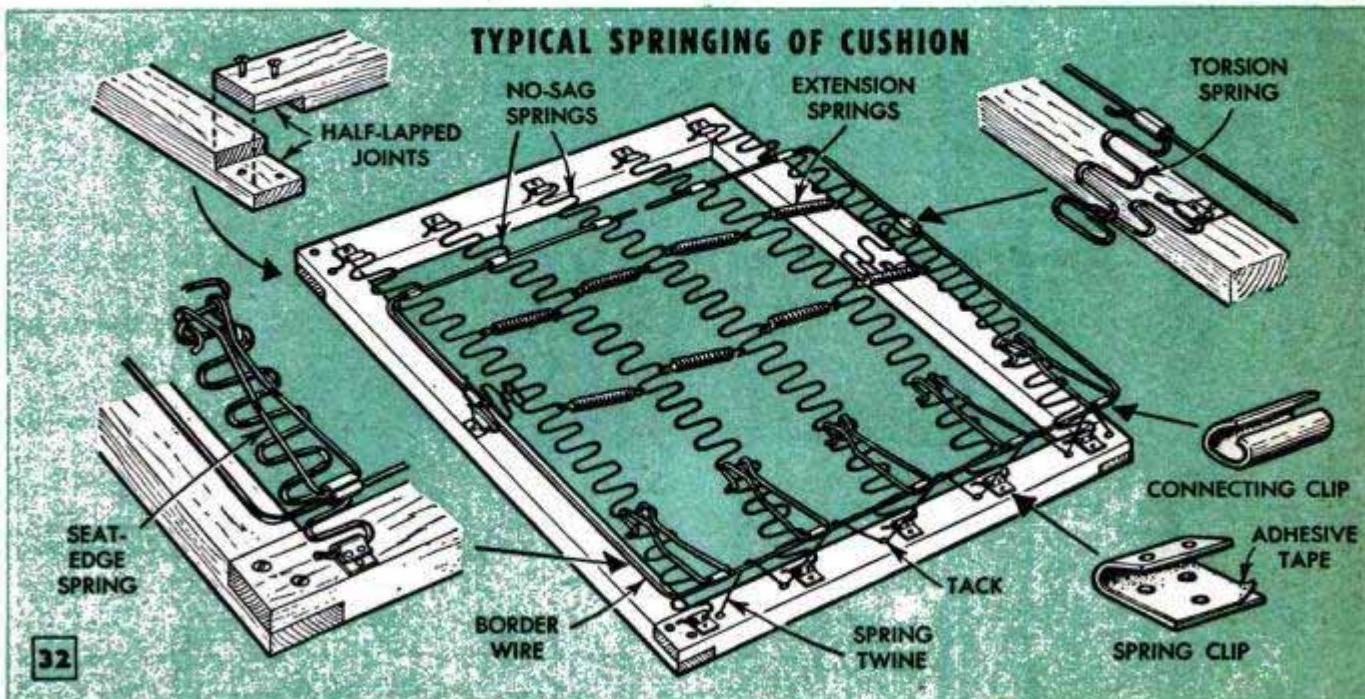
29

Above, here the seat and back cushions of the easy chair are being tested for satisfactory fit prior to covering with fabric. Screws hold cushions in place



30

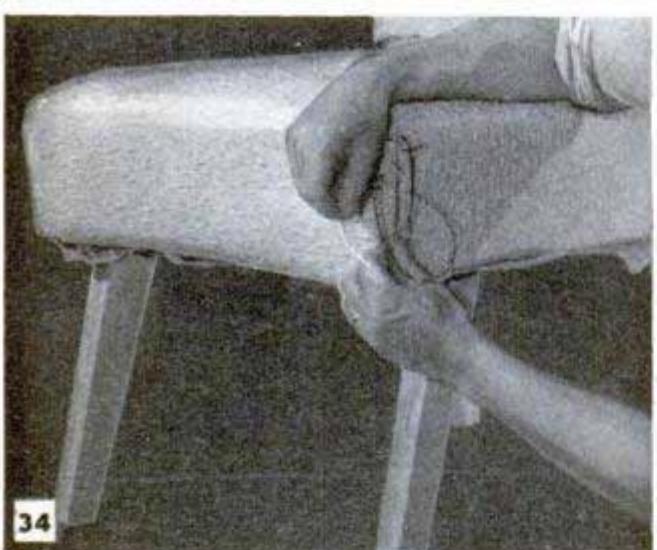
TYPICAL SPRINGING OF CUSHION



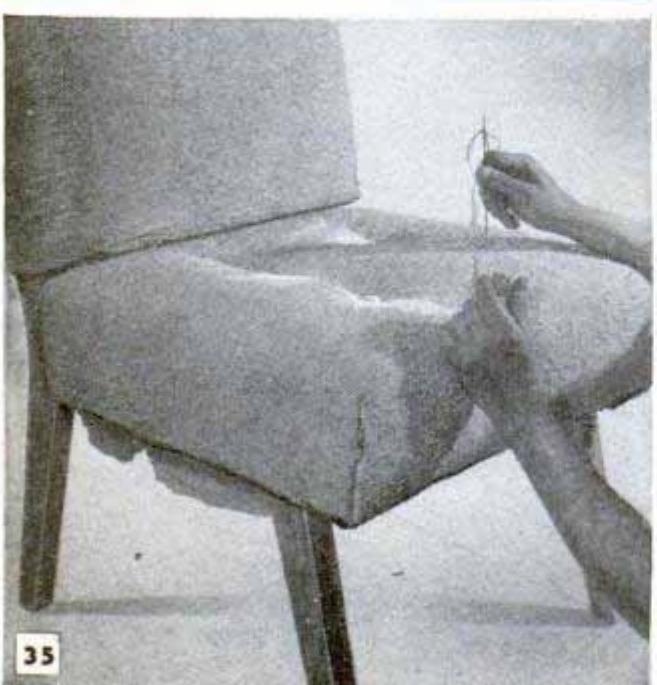
32



33



34



35

recommended that the direction of the bent ends be alternated. If the bent end of the first spring points to the right, the bent end of the next spring should point to the left. This permits the connecting extension springs to be applied in a straight line. The springs are applied bowed and are cross-tied with eight extension springs. Edge springs are hooked into the sagless springs across the front and these serve to support an 8-ga. border wire which forms the box shape of the spring unit. The border wire is attached to the edge springs with special clips which are crimped over the two parts. This type of clip also is used to fasten the rear edge of the border wire to the sagless springs. At each side, a torsion spring is used to support the border wire, clips being applied as before to anchor it to the wire and the wooden frame. You'll note that the border wire does not extend to the rear of the frame but stops about 8 in. or so from it. This is done to allow room for the back cushion to fit neatly into the seat cushion. Finally, the border wire across the front edge is pulled down under tension with regular spring twine and tacked securely to the wooden frame. The back cushions are sprung in exactly the same manner, the front edge of the seat becoming the top edge of the back.

The next step is to cover the spring unit with burlap as shown in Fig. 30. This is simply pulled firmly over the border wire and tacked to the edges of the frame. Now, the spring unit is covered with a marshall unit which is made up of a number of individual coil springs encased in cloth pockets. These are purchased in strips and you merely build-up the unit to the required size by sewing them together as in Fig. 26. The seat requires a unit seven coils wide and nine coils deep, while the back takes seven wide and five deep. The completed unit is sewed to the spring unit, using a curved upholsterer's needle and sewing around the border wire and the base of each individual coil spring, Fig. 27. Next, moss or tow filling is placed on top of the marshall unit and then two layers of cotton, Fig. 28. This is followed by covering the cotton with muslin, pulling it down smoothly and tacking it to the underside of the wooden frame. Fig. 29 shows checking the cushions for fit after the muslin covering has been finished. Box corners are formed at the front corners of the seat and at the top corners of the back cushion by hand-stitching the fabric covering as shown in Fig. 34. The cushions are held in place in the chair with flat-headed screws. In the case of the seat, the screws are driven up from below in counterbored holes in the rails. The back cushion is held with four screws which are driven through holes in the back of the chair frame and capped with

regular wooden screw plugs or short lengths of dowel rod. The back cushion differs from the seat in one respect. With the underside of the frame exposed, the back must be fitted with a fabric-covered cardboard panel before fastening the cushion to the chair frame.

The hostess chair is upholstered in the same general manner, except that the springing is done right on the chair frame as indicated in Fig. 37. Five, 9-ga. sagless springs, 20½ in. long are required for the seat and five, 12-ga. springs, 14½ in. long are needed for the back cushion. Also, 10 additional seat edge springs are required as these are installed at both front and back, Fig. 37. The fabric covering is brought down over the rails of the seat and tacked to the underside. The back is covered similarly, Fig. 33. The rear of the back is enclosed with a fabric-covered panel in the same manner as previously described, nailing it with gimp nails and then pulling the material up over the heads. If padded arms are to be used on the chair, brush edging is applied around the outside edge of the arms, Fig. 16, and a cardboard panel is used on the outside.

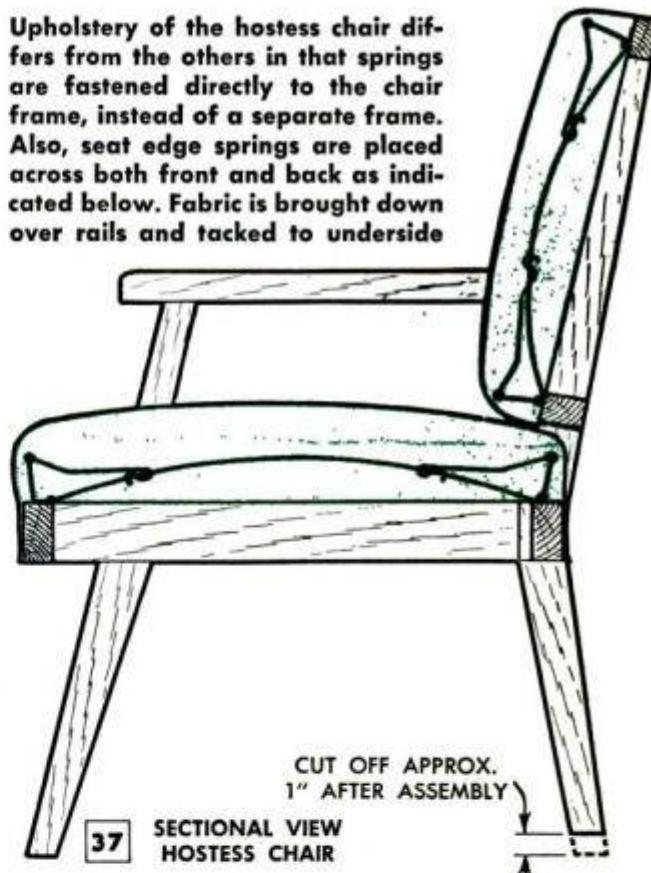
Tufting the seat and back cushions gives them a professional touch. Four buttons are placed in the seat cushions of all the pieces and two in the back cushions. Plain wooden buttons made for this purpose are covered with scraps of fabric and then stitched through to the springs, Fig. 35. The tufts are made by pulling down on the buttons and tying the sewing twine securely to the sagless springs, Fig. 36. Finally, cambric dust covers are tacked to the underside of each seat cushion.

The lamps are detailed in Figs. 38 and 39. The table lamp features four 6-in.-sq. ceramic tiles framed in a box-shaped base. These can be purchased in any large department store and, as the exact size of the tile varies somewhat, buy them first and build the base around them. The sectional view shows how the wooden members are grooved for the tiles which are installed as the assembly progresses. Corners of the base are mitered and holes are provided for a 30-in. length of ¼-in. threaded pipe. The exposed portion of the pipe is covered with ½-in. brass tubing as indicated. Then, with a standard cap and canopy attached to the top, a locknut concealed in the base of the lamp ties the assembly together.

The wooden column of the floor lamp, Fig. 38, is made up of two separate pieces to provide a center hole for the lamp-cord pipe. A ¼ x ½-in. groove is run lengthwise in each piece and then the two are glued and clamped together before tapering. Assembly of the top portion of the standard is shown in the detail above Fig.



Upholstery of the hostess chair differs from the others in that springs are fastened directly to the chair frame, instead of a separate frame. Also, seat edge springs are placed across both front and back as indicated below. Fabric is brought down over rails and tacked to underside

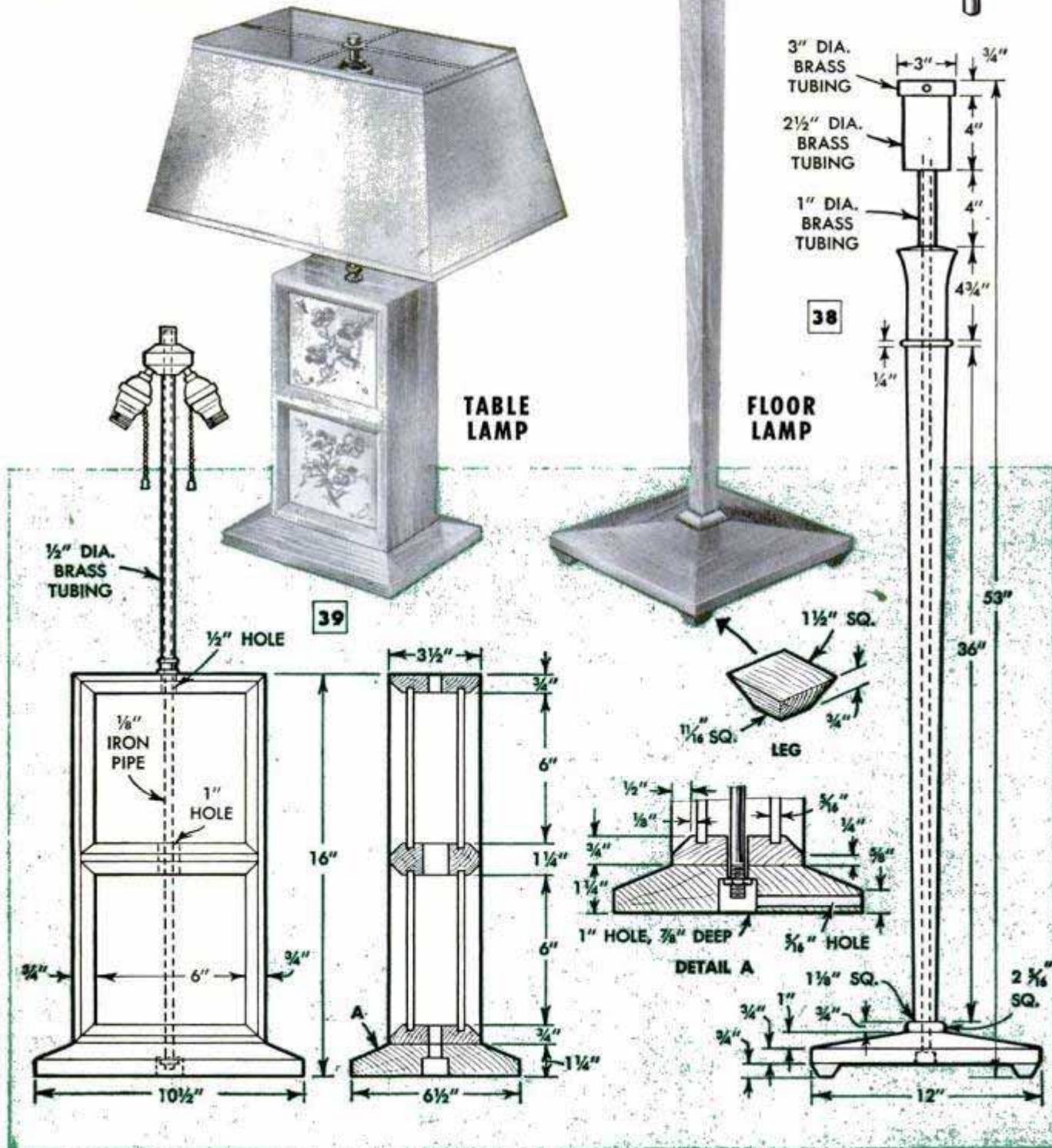


38. The brass fixture at the top of the wooden column is not a stock item but is made up specially from lengths of brass tubing soldered together.

The fixture is designed to take a standard mogul-type socket which is screwed to the upper end of the ¼-in. pipe. A hole is provided in the side of the fixture to accommodate the socket turn button and the top ring

is fitted with three thumbscrews to support a standard 10-in. glass bowl. The base of the lamp consists of four 1 $\frac{3}{4}$ -in.-thick pieces planed to $\frac{3}{4}$ in. at the edge and mitered at each corner. These are glued together and then a flat surface is planed at the apex of the four pieces to receive a $\frac{3}{4} \times 2\frac{5}{16}$ -in.-sq. block. Then a $\frac{1}{2}$ -in. hole is bored through the center and the hole is counterbored on the underside of the base to take a nut and washer. A small tapered leg is glued and screwed to each corner of the base and then the lamp column is tightened securely to the base by means of the nut in the bottom.

Plans detailing the entire living-room set are available for those who prefer to work from larger drawings.



Gluing Paper Doilies to Solid Backing Provides Novel Picture Frame

Gluing a stack of paper doilies to a rigid backing and jigsawing around the design results in an attractive embossed picture frame. Hardwood, plywood or heavy, rigid cardboard will provide a suitable backing. First, shake the loose punchings from the doilies and stack six to eight of them together so the designs are in exact register. Then, coat the backing with glue, set the stack of doilies in the glue and flow glue liberally over the doilies. A casein glue is excellent for this purpose and, if used, about 50 percent more water than normal should be added so the glue will penetrate the paper readily. Allow the glue to soak into the paper for a few minutes and carefully press a dry rag over the surface to absorb the excess glue. After the glue has set for 24 hours, jigsaw the picture frame, following the outline of the doily. Rabbet the back of the frame to permit mounting the picture, using a router or chisel and making the rabbet $\frac{1}{8}$ in. deep and from $\frac{1}{4}$ to $\frac{1}{2}$ in. wide. If desired, the backing can be painted before gluing so the color will show through the perforations in the doilies, or the completed frame can be painted to suit. In the latter case, the paint should be thinned



considerably so it will not fill the perforations in the doilies and destroy the embossed appearance. If the proper design of doily is used, as many as four frames of diminishing sizes can be jigsawed from one gluing operation.

Edward J. Hobert, Hempstead, N. Y.

WTM-51 Glittery Christmas-Tree Ornaments Made From Midget Photoflash Bulbs

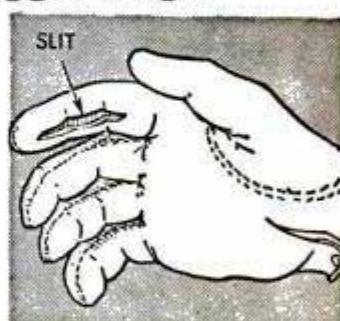


Made From Midget Photoflash Bulbs

Inexpensive Christmas-tree ornaments that sparkle in the light of the colored bulbs can be made quickly from bayonet-type photoflash lamps. Remove the prongs and contact and fit the base of the lamp with a hanger bent from a paper clip. Then coat the bulb with mucilage or rubber cement and sprinkle it liberally with silver or gold-colored metallics, commonly called flitter and used by show-card painters. After the adhesive dries, shake off the excess metallics.—Jeanne Stasack, Chicago.

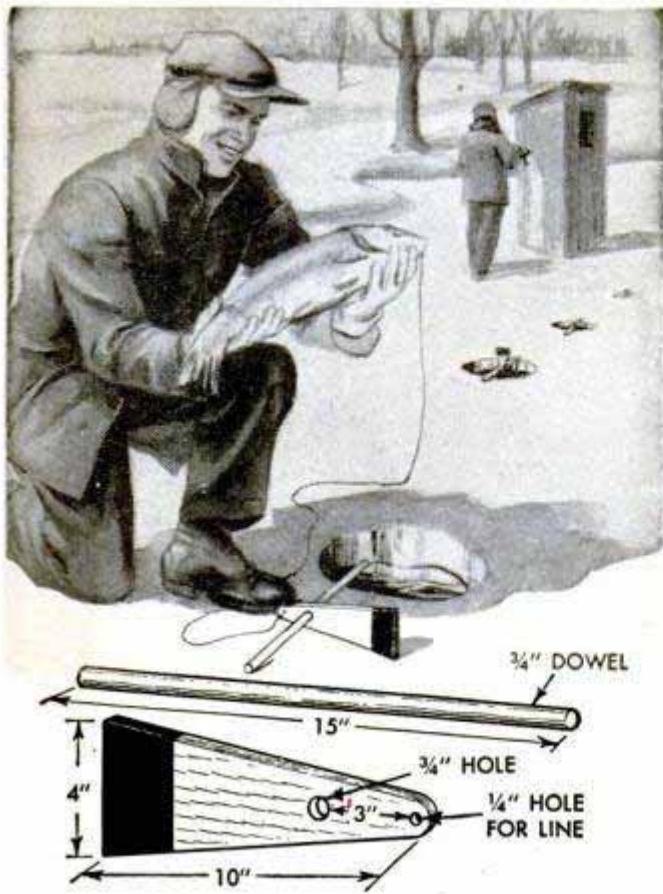
Glove Slit for Trigger Finger

In cold weather, a quick shot with rifle or shotgun is impossible if it is necessary to remove a bulky hunting glove before firing. One experienced hunter slits the underside of the index finger of his glove. In this way, he can slip his trigger finger out of the hole for a quick shot without taking off the glove.



Immediately sponging with turpentine will remove fresh paint spots from a rug.

Knockdown Ice-Fishing Tipup Is Conveniently Carried



Made quickly from plywood and 3/4-in. dowel, a dozen or more of these ice-fishing tipups can be carried in a compact bundle or in a sack. The tapered flag is drilled at the lower end to permit tying the fishline and a hole for the dowel is drilled about 3 in. from this point. The dowel should be a fairly snug fit in the hole, but loose enough to permit pulling it out readily when taking the tipup apart for packing. The upper end of the flag, which rests on the ice when the line is set, is painted red so it can be seen easily.

Pulling Staples From Bulletin Board Facilitated by Tape Strips



When stapling a notice to a bulletin board, drive the staples through a cloth-tape border. In this way, all the staples can be removed quickly simply by pulling the end of the tape. Drive the staples across the tape so the latter will not be torn loose leaving the staples intact. If it is desired to draw special attention to a bulletin, use a brightly colored tape to frame it. This

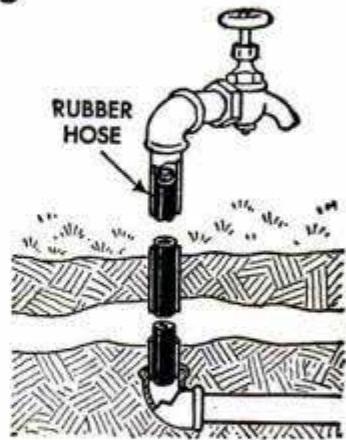
method can also be used with thumbtacks instead of staples.

Andrew Vena, Philadelphia, Pa.

Hose in Frozen Hydrant Pipe Prevents Bursting

If an outdoor water hydrant cannot be protected from freezing, a plugged length of rubber tubing placed inside the vertical pipe will keep the latter from bursting. Cut the tubing to the longest length possible and plug both ends tightly. Then slip the tubing in the pipe where it will take up the expansion of the water as it freezes.

Edward H. Stutz, Cleveland, Ohio.

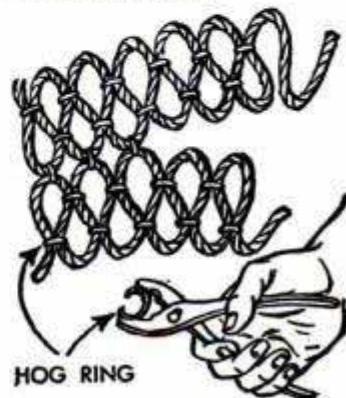


Don't Use Inferior Brake Fluid

There are few sensations as frightening as pushing the brake pedal of your car down to the floor and finding that nothing happens. The cause is likely to be an inferior grade of hydraulic-brake fluid containing a low-boiling solvent. Whenever your brakes are used frequently, particularly in hot weather, the temperature of the fluid is likely to be raised to the boiling point of some solvents, forming vapor pockets in the hydraulic-brake lines. The result is that the brakes don't work, and the car won't stop until the fluid is allowed to cool. To play safe, be sure that the brake system in your car is filled with a fluid meeting the specifications of the Society of Automotive Engineers, or one as good as the fluid recommended by the car manufacturer. The SAE has adopted specifications for both an all-purpose, heavy-duty brake fluid and a moderate-duty fluid.

Rope Linked With Hog Rings Provides Durable Door Mat

Forming lengths of rope into series of loops and binding them together with steel hog rings results in a durable, light-weight door mat. It can be made any desired size.—R. E. Wade, Three Rivers, Mich.



BUY THE RIGHT CHRISTMAS TREE

By Edward L. Throm

IN THE NORTH WOODS country on both sides of the Canadian-American border, axes are ringing and saws are singing all through November and early December. The woodsmen cut more carefully than usual, and do not lop off branches, for they are working on the annual supply of millions of evergreens needed for the celebration of Christmas.

Loaded on huge logging trucks, the trees are rushed to the nearest loading point, and then are transported either by large motor trucks or by rail to wholesale and retail markets.

But not all of the evergreens marketed for Christmas trees are ideal for the purpose. Some dry out quickly, shedding their needles faster than the children can eat the first batch of Christmas candy. And, because of their dryness, such trees present a dangerous fire hazard. Others will never make satisfactory Christmas trees because their shape does not conform to our ideas of a beautiful tree.

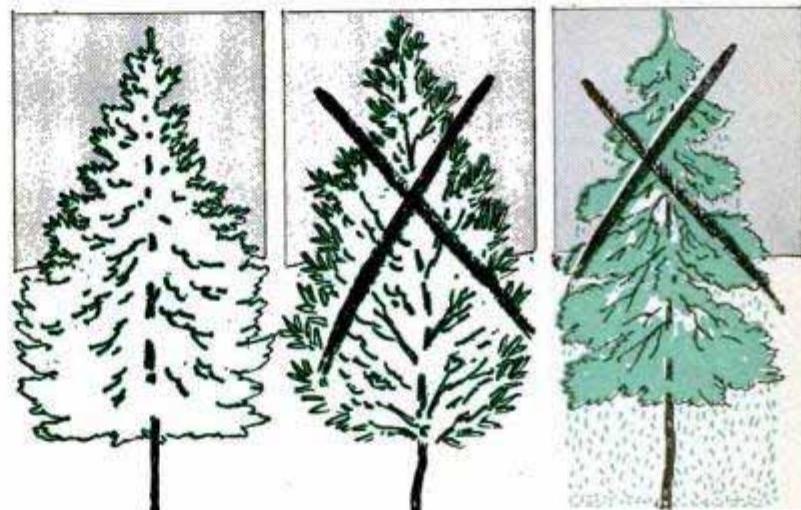
The Douglas fir is the ideal evergreen for Christmas-tree purposes. You can tell it by its soft, flat needles, and the buds at the ends of the branches which cause the needles to bend aside gracefully. The form of the Douglas fir is usually a long pyramid, uniformly shaped on all sides.

One of the least desirable Christmas trees is the spruce, which looks quite like the Douglas fir. You can identify it by the sharpness of its needles, and the ease with which they break off when handled. Beware of hemlock, too, which also sheds its needles rapidly. Look for two white lines on the under side of the hemlock's needle-like leaves.

Pines would make good Christmas trees except for their habit of growing informally in all directions. Rarely do they assume the pleasing contours we have come to desire in a holiday tree.

Red cedars are not often seen on the market, but make colorful Christmas trees when they can be obtained. Their scalelike foliage is very tiny, and they produce berries instead of cones.

Select your Christmas tree for its shape rather than its size. You'll find that it will attract far more attention than a larger tree



Douglas Fir

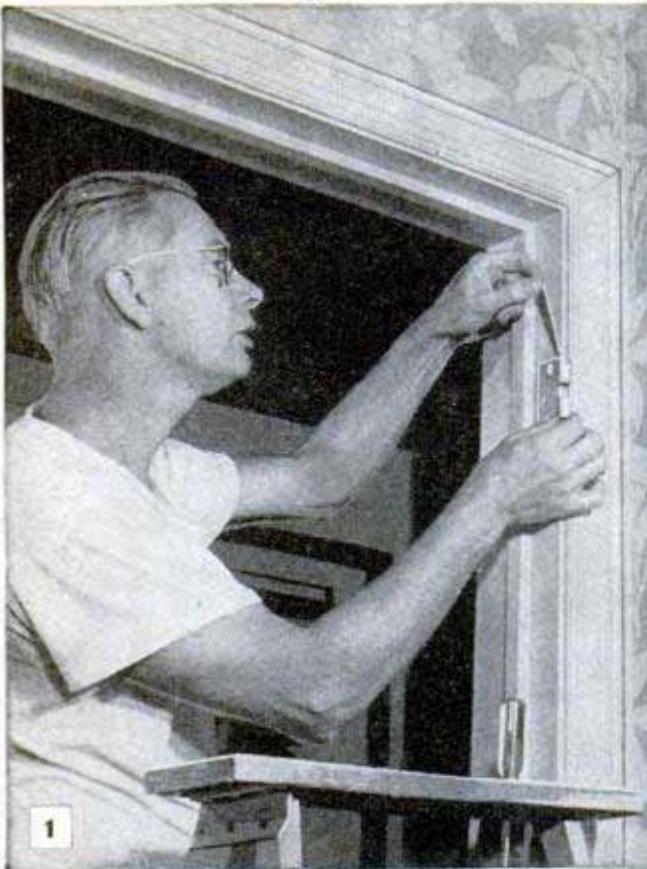
Spruce

Hemlock

having unpleasing proportions. It is best to have selected the place where the tree is to be set up beforehand, so that a tree of appropriate size may be chosen.

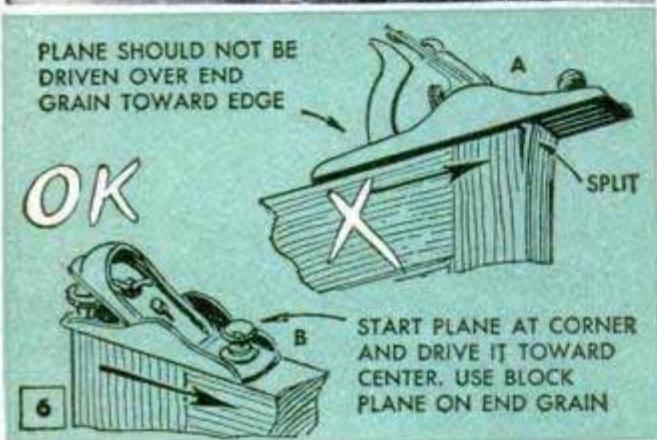
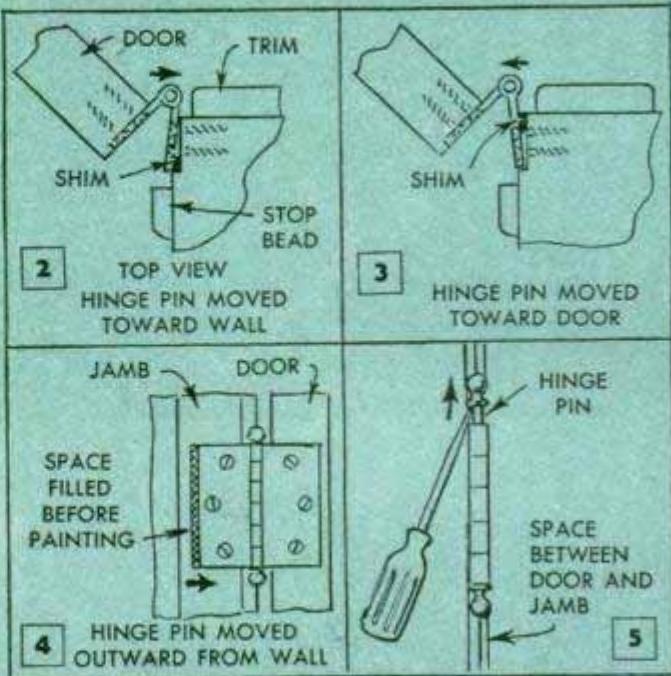
Don't buy a tree that's too large for the number of ornaments you have or can afford to add to your supply. A sparsely trimmed tree can be an eyesore, while a smaller tree, tastefully decorated, can be a thing of great beauty. On the other hand, trees can be overloaded with ornaments.

When you get the tree home, keep it in water or moist sand until it is time to set it up for decorating. If it is at all possible, set your Christmas tree in a small watertight tub or some other type of stand which will make it possible for you to water the tree from time to time. By doing this you will be guaranteed a fresh, green tree all through the holidays. Watering the tree will also lessen the danger of fire from a short circuit in the tree-light system or a spark from an electric toy near the tree, as a green tree will not catch fire readily.



1

KEEPING DOORS



By E. R. Haan

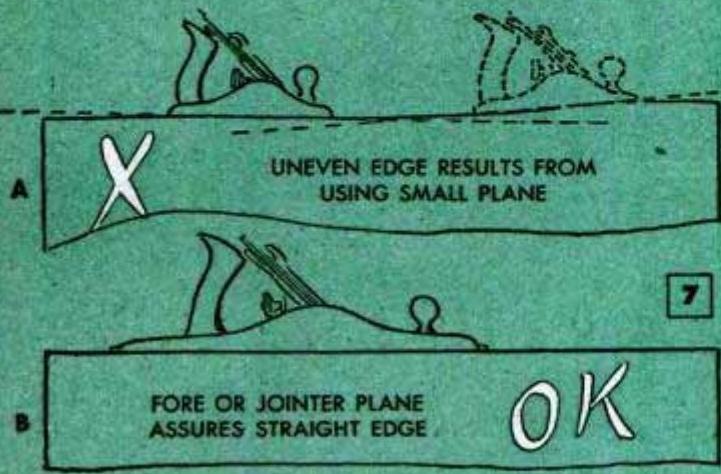
DOORS that stick, rattle or fail to open and close properly are easily repaired and adjusted by the average homeowner without any outside help. No special tools are required to do a workmanlike job. In addition to the normal wear to which house doors are subjected, shrinking and warping of wood and settling of the building contribute to the causes of common door troubles. When properly hung, a house door should have a uniform clearance between its edges and the frame of about $\frac{1}{16}$ in. If this is not the case, it should be possible at least to insert a sheet of paper between the door and the jamb and draw it along from corner to corner unrestricted except by the latch and hinges. There also should be $\frac{1}{16}$ -in. clearance between the hinged edge of the door and the stop. When halfway open, the door should not tend to swing open or shut, nor should it bind at any point within the normal swing. Usually

such troubles are caused by the hinge pins not being in vertical alignment. The hinge screws should be tight and the door should not rattle when fully closed. The latch plate must register with the striker plate so that both the latch bolt and the dead bolt engage the openings in the striker plate when the door is closed.

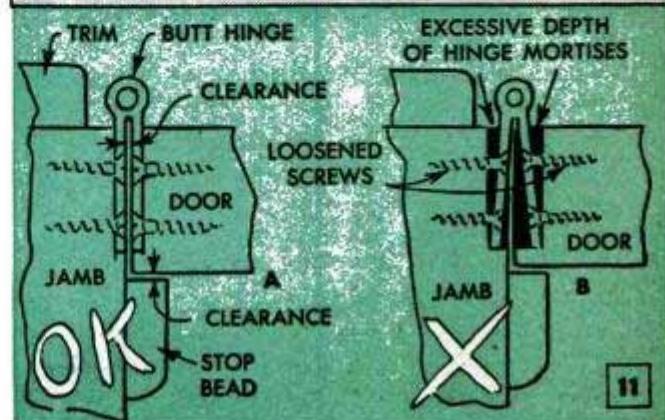
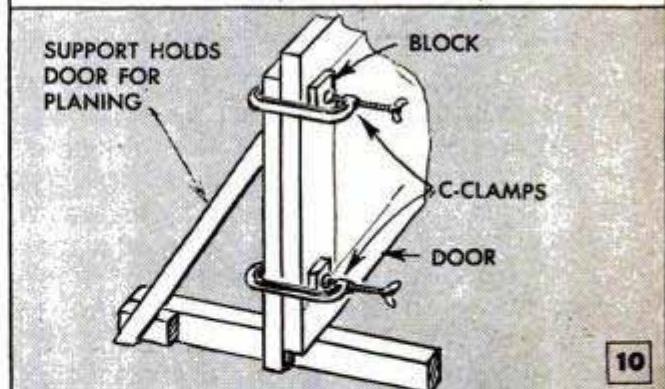
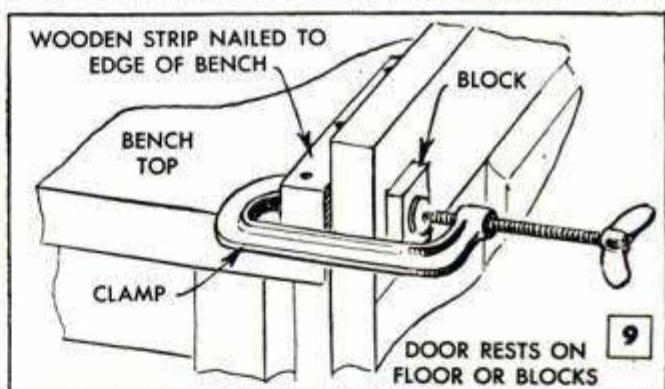
Sticking doors: Very often the cause of a sticking door can be remedied without planing either edge. First, check to see that the hinges are tight. Stand in front of the door edge and, with a hand on each knob, try moving the door toward and away from the hinges. If the hinges move, tighten the screws. If the screw holes are enlarged, drive in longer and larger screws. If the trouble does not show up in loose hinges, it is possible that the doorframe may have been forced out of square by settling of the house. Often it is possible to readjust the door by placing folded paper shims under the hinge leaves as in Figs. 1 to 3 inclusive. By positioning the shims under the front or rear edge of the hinge leaves, the pins are shifted toward the right or left as indicated by the arrows in Figs. 2 and 3. When using these methods, be sure that the space between the door and the frame is as uniform as possible after tightening the screws. If the hinges move as the door is closed, thinner shims will have to be used. When it is necessary to move the hinge pins out and away from either the stop or the wall in order to get them in alignment, the hinge may have to be reset on the jamb as in Fig. 4.

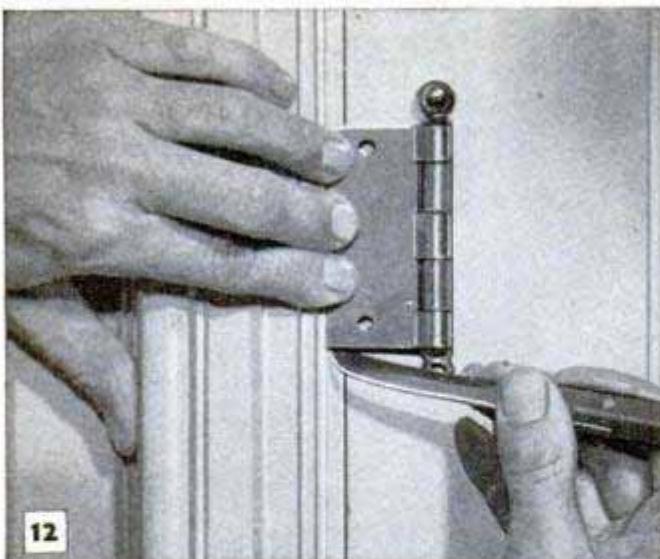
AT THEIR BEST

How to make those minor repairs and adjustments that help keep house doors in first-class working condition—simple jobs that any homeowner can do in spare time with only a few common household tools

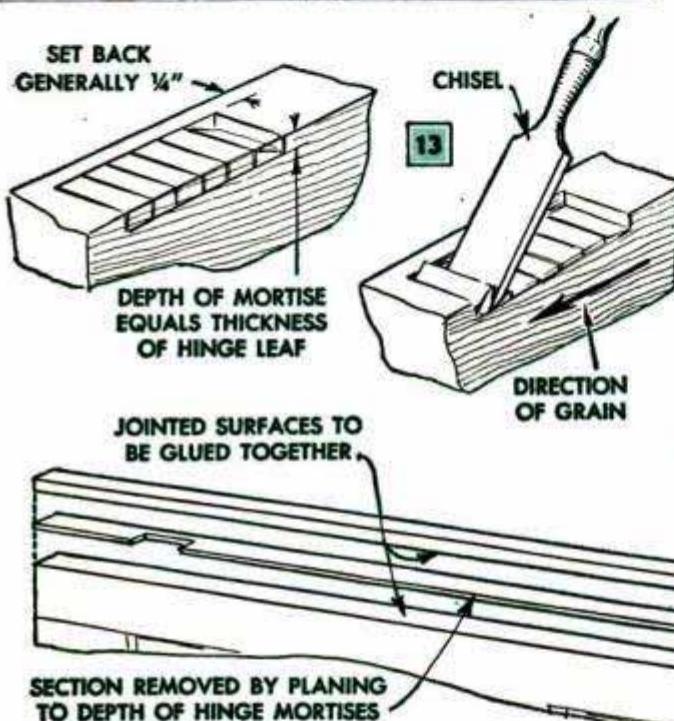


Planing door edges: When tightening of hinge screws or shifting of the hinges does not free a door that sticks, then the removal of wood from the edge of the door with a file or plane will be necessary. If the door sticks at the top or bottom try a coarse file first. If planing is necessary to remove more wood, use a block plane or a smooth plane on the end grain. When planing the ends of the stiles (vertical members of the frame of the door) always stroke the plane from the edge of the door toward the center, Fig. 6,B, to avoid splitting off the corners of the stiles, Fig. 6,A. When the door sticks along the latch edge, or if it cannot be closed, remove it from the frame so that the hinge edge can be planed. To do this, push a wedge under the door near the latch edge and remove the hinge pins, Fig. 5. If the door has three hinges, remove the lower and center pins first, then the upper one, after which the door can be lifted from the frame. Next, remove the hinge leaves from the door and support it rigidly on edge against a workbench as in Fig. 9, or make a door jack as in Figs. 8 and 10. Measure the exact width of the doorframe at several points from bottom to top. Transfer these measurements to the door and mark a gauge line along the hinge edge, allowing $\frac{1}{16}$ in. for clearance. Plane off the waste to the gauge line and deepen the hinge mortises, or gains, so that the hinge leaves will again be flush with the surface of the wood when screwed back in position as in Fig. 11,A. Rehang the door by simply reversing the procedure used in

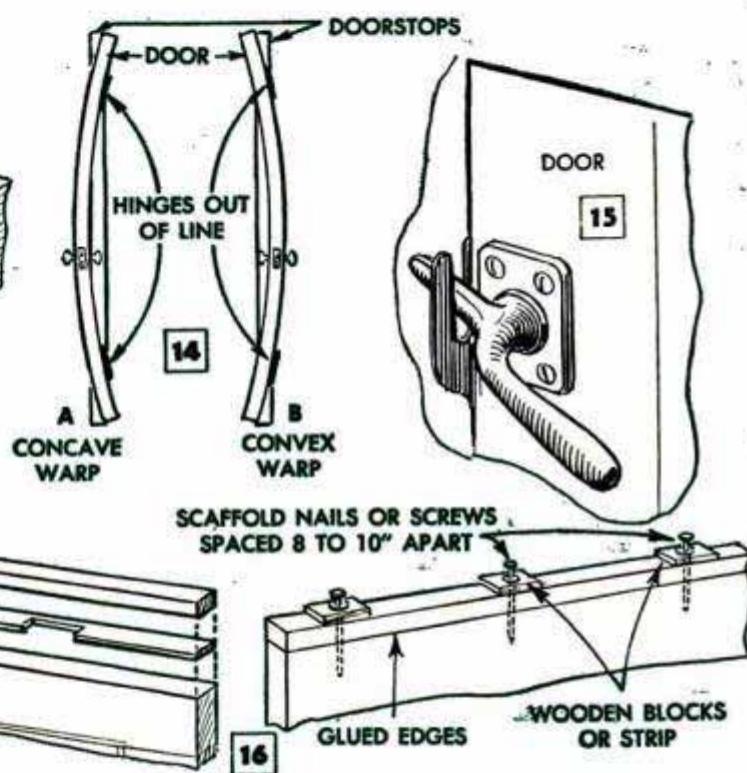




12



running the chisel edge in from the side. This must be done with care to avoid cutting too deep and splitting the wood beyond the sides of the mortise. Center hinges are necessary on heavy doors and also are used on light doors to prevent warping. The size of the individual hinge required is largely determined by the size of the door. For standard doors $1\frac{3}{8}$ in. thick, $3\frac{1}{2}$ -in. butt hinges generally are used. For doors over 36 in. wide and 2 in. or more in thickness, 5-in. butt hinges are fitted. When repositioning hinges or installing them on new doors, avoid locating the hinge pins too close to the frame. This may cause the edge of the door to strike the stop. To as-



removing it. Spread a drop of light oil on each hinge pin before inserting it in the hinge eyes. When planing the edges of doors in the manner described, always use a fore plane or jointer plane to assure a straight edge as in Fig. 7.B. Use of a jack plane or smooth plane may result in an uneven, wavy edge as in Fig. 7.A, due to the short length of the plane bottom. Always set the plane blade to cut a very thin shaving. This will produce a smooth cut and will avoid removal of too much wood.

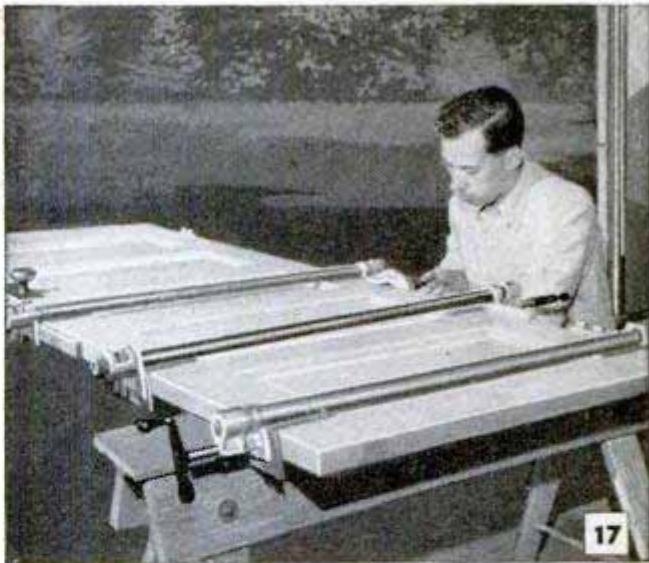
Hinge details: When hinge mortises are too deep, the edge of the door will press so tightly against the jamb when closed that the hinge screws are gradually pulled loose as in Fig. 11.B. This condition can be corrected by inserting cardboard shims under the hinge leaves. Hinges also may be loosened if the mortises in the jamb are slanted. When deepening or truing hinge mortises, make successive cuts with a chisel as in Fig. 13, and then pare out the waste by

sure free and noiseless operation, door hinges should be cleaned and oiled at regular intervals.

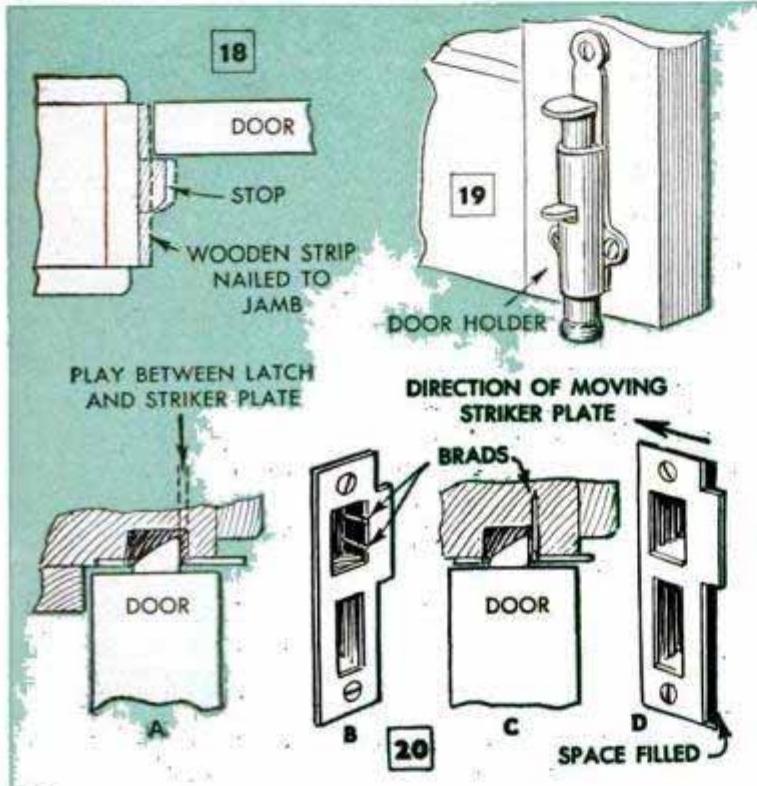
Warped doors: Doors that warp, Fig. 14, not only are difficult to open and close, but they cannot be satisfactorily weatherstripped or locked securely because of misalignment of the hinges and latch. Doors made from woods not thoroughly seasoned are more likely to warp excessively, especially if the thickness of the stiles and rails is $1\frac{3}{8}$ in. or less. A common remedy for either convex or concave warping is the installation of a third hinge midway between the other two. Care is taken to see that the pin of the middle hinge is in line with the other hinge pins. To install the middle hinge, mark the door and jamb as in Fig. 12. Then remove the door, cut the mortises and install the hinge leaves. When rehanging the door it will be necessary to apply pressure to the center to force the hinge eyes in line so that the pin can be

inserted. Sometimes only the stile on the latch edge of the door is warped, the other being comparatively straight. This problem is somewhat more difficult to solve, but it generally is possible to reverse an inside door and effect a satisfactory repair. The hinges and latch are transposed from one side to the other and the old hinge and latch mortises are concealed with filler blocks and plugs. These are sanded flush so that they will be concealed when the door is refinished. If paint or enamel is used, the repair will not be discernible.

Outside doors which are directly exposed to weathering and also to warm, moist air on one side and cold, dry air on



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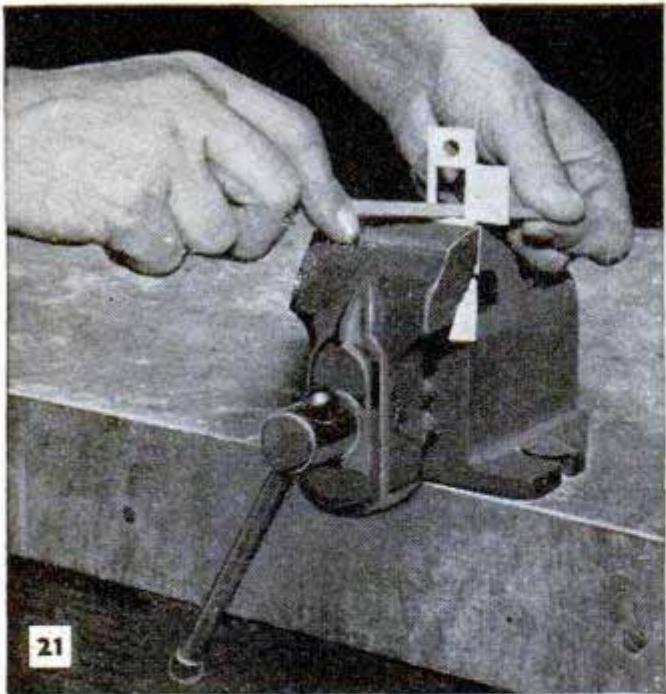
the other, will warp if they are not well protected with an unbroken film of paint or varnish at all times. This protection should include both sides and all edges. Especially susceptible to damage by exposure are those doors which open onto porch decks, high terraces or patios. To keep such doors tightly closed and prevent warping it's often advisable to install extra latches of the type shown in Fig. 15.

Doors that are too narrow: When settling of a house causes a doorframe to spread, sag or become distorted in any way, or when the door itself shrinks excessively because of the use of unseasoned wood, there may be too great a gap between it and the jamb to permit the latch bolt to engage the striker plate. For a temporary repair, thick cardboard shims or thin strips of plywood can be inserted under the hinges. A better and more permanent remedy for this particular condition is to glue a strip of wood to the hinge edge of the

door as in Fig. 16. Remove the door, support it vertically with the door jack as in Fig. 10 and remove the hinge leaves. Then plane down the stile to the bottom of the hinge mortises, taking special care to joint the edges square. Then rip a strip from the same kind and grade of wood as that in the door and somewhat thicker than required to build the door out to the needed width. Spread waterproof glue on one face of the strip and also on the edge of the door stile. Then clamp the strip to the door edge with at least four bar clamps. If bar clamps are not available, scaffold nails or screws driven through small blocks and through the strip into the door stile at regular intervals will hold the edging in place until the glue sets. Remove the nails, or screws, after the glue is dry and fill the holes with putty. Plane the door to the required width, mortise the hinge leaves and rehang.

Another method of making a narrow door fit a distorted frame is detailed in Fig. 18. In this case, a thin strip of wood is nailed or screwed to the jamb on the latch side of the frame, and the stop and striker plate are replaced. If the stop is of the type not readily removable, then a narrow filler strip only as wide as the thickness of the door is used.

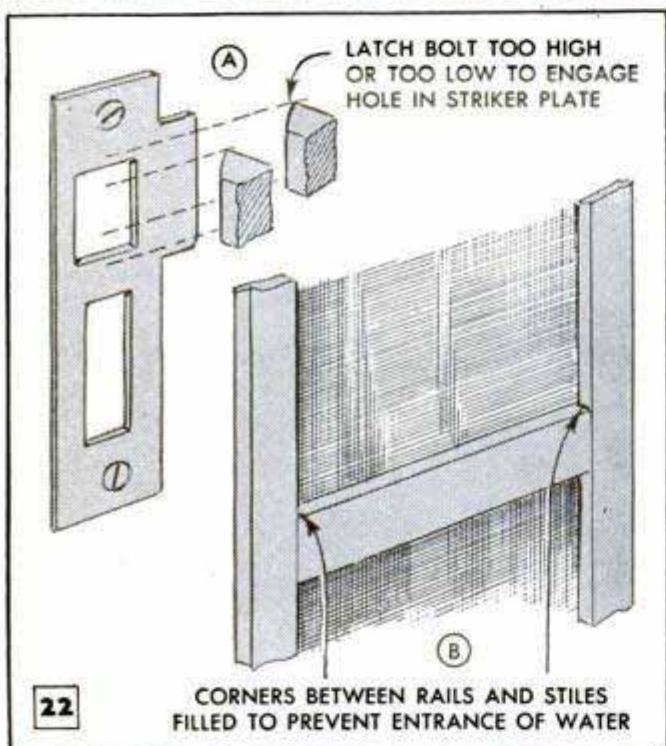
Regluing doors: Doors which are unprotected on the top and bottom edges with paint or varnish absorb considerable moisture during the summer months when the humidity is high. Changes in the wood due to swelling and shrinking eventually will break the bond of the glue in the joints, causing them to open. Filling the cracks will do little good as alternating changes in the dimensions of the parts will quickly break the crack filler loose. The only effective and permanent remedy for a door in this condition is to remove it from the frame and reglue the joints with waterproof glue. To do this, place the door on sawhorses and carefully pry the joints open with a narrow chisel or screwdriver.



21

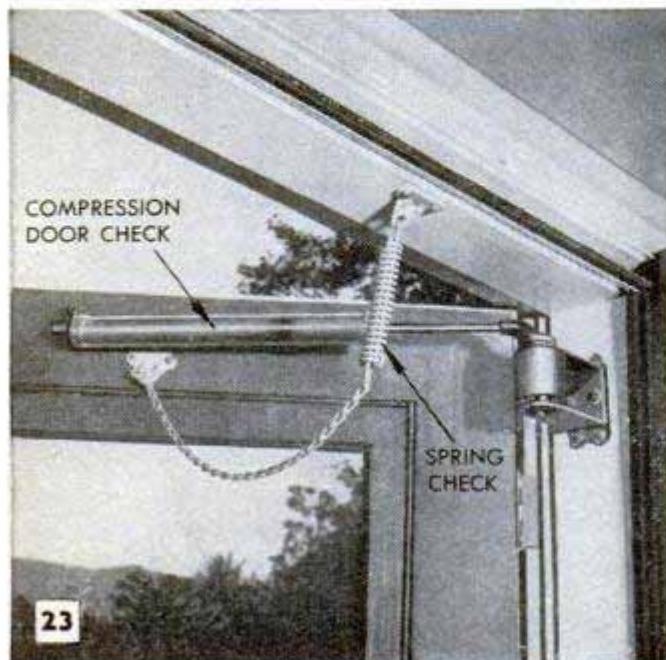
Spread glue liberally in the opened joints and immediately draw the parts together with bar clamps as in Fig. 17. Wipe off all excess glue with a damp cloth. Be sure that the glue is thoroughly dry before releasing the clamps. Then refinish the door and rehang.

Doors that rattle: One of the most common annoyances is a door that rattles. This can be caused by a draft of air and is especially troublesome if the latch bolt fits the striker plate loosely as in Fig. 20,A. Often, an effective temporary repair is made by driving one or two small brads into the wood under the striker plate so that the top ends will be flush with the surface of the plate as shown in details B and C of Fig. 20. This gives the same effect as moving the plate. Cut the heads off the brads if necessary and, if they still are too large, dress them lightly with a small file so that the latch bolt will slip into place when the door is fully closed. The permanent repair, of course, is to move the striker plate as in Fig. 20,D, or move the doorstop. Moving the striker plate generally is best as the stop may be splintered or the finish damaged in the process of moving it. In moving the striker plate, it will be necessary to pare the sides of the offset mortise to allow room for the latch bolt and dead bolt to slip home when the door is closed. If an open door slams hard as the result of a sudden draft from an open window, it may be extensively damaged. In some cases hinges and joints are loosened or broken. To guard against possible damage and, at the same time, to hold the door securely open, install a foot-operated holder like the one shown in Fig. 19.



22

Bolt does not enter striker plate: Another door defect caused by settling of the building is that the latch bolt does not enter the opening in the striker plate, but rides on the plate above or below the opening as in Fig. 22,A. Sometimes the opening in the striker plate can be enlarged sufficiently with a file as in Fig. 21 but, when the bolt misses by more than $\frac{1}{16}$ in., it is better to move the plate. First, determine the exact path of the bolt by closing the door until the latch bolt touches the projection of the striker plate. Mark the point at which the upper edge of the bolt contacts the plate, then remove the latter and mark the path of the bolt across the width. With this mark as an index, it is easy to determine where to locate the plate. Enlarge the plate mortise accordingly and install the plate in the new position. When moving the striker plate up or down in this manner, it sometimes happens that one of the striker-plate screws will enter the mortise made for the latch bolt or dead bolt. Should this happen, drill a hole in the bottom of the mortise



23

and glue in a short length of $\frac{1}{2}$ -in. dowel to serve as an anchor for the screw.

Thresholds: When thresholds under outside doors become worn or splintered they should be renewed. After removing the door and stops, it's easy to pry up the old threshold and install a new one. Thresholds are available in standard widths and after cutting to length they should be painted or varnished on the underside before installation. Hardwood thresholds are preferable to those of softwood. Space between the door and the threshold should be sealed tightly when the door is closed to prevent entrance of cold air and water. An interlocking weather strip consisting of a saddle screwed to the threshold, and a metal strip screwed to the bottom of the door, will prevent air and water leaks. Usually the metal saddle is set in calking compound.

Screen doors and combination doors: The combination screen-and-storm door is exposed to severe weathering and should be adequately protected with paint or spar varnish. When repainting this type of door and also screen doors, work the paint down into any tiny openings or cracks between the rails and stiles, Fig. 22,B. All doors having plywood panels, such as garage doors, should be painted regularly to prevent the panels from loosening or warping. On combination doors fitted with one or more plywood panels, be sure that open cracks at the joints are closed with paint or filler to keep out moisture and prevent damage. To correct sagging screen doors and combination doors use adjustable braces made especially for this purpose. Braces of the same type, but larger and heavier, are available for use on garage doors. Constant slamming of screen and combination doors under tension of a coil spring is not only annoying but damaging to the door. Also, there is always the danger that sudden gusts of wind will swing a combination door violently against the house and split the hinge stile. A spring check of the type shown in Fig. 23 will prevent this damage. Some homeowners use both spring and compression checks on the same door as indicated in the photograph.

Pads on Soles Prevent Slipping



When you have to walk on streets or sidewalks covered with ice, you can reduce the possibility of slipping by sticking two or three heavy

bunion pads to the sole of each shoe. Wipe the soles clean with lukewarm water and dry thoroughly before applying the pads.



Garments Protected From Dust While Hanging in Closet

Paper bags in which garments are returned from the dry cleaner can be put to good use as dust protectors for garments hanging in a closet. Slit open one side of the bag with a knife to simplify placing it over the garment and, when it is in place, fasten the side with paper clips.

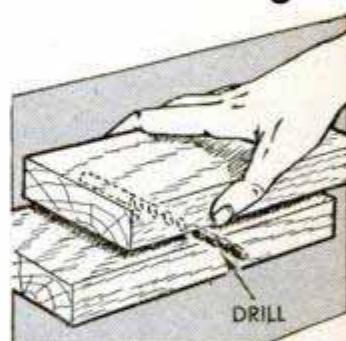
Lawn Roller Filled With Oil Does Not Rust or Freeze

To keep the inside of a lawn roller from rusting, fill it with used crankcase oil instead of water. Thus, the roller does not have to be emptied during the winter, as the oil, of course, will not freeze.

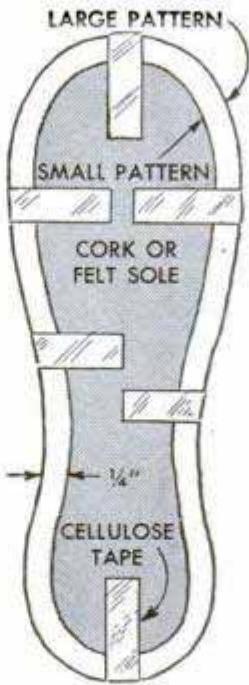
Drills Rolled to Prevent Breaking

The slightest bend in a small twist drill is likely to cause poor work and may eventually result in a broken drill. These bends can be straightened and the life of the drill prolonged by rolling it between two hardwood blocks. The faces of the blocks are sanded smooth and, with the drill laid crosswise between them, the top block is moved back and forth to roll the drill. Straighten small drills in this manner at regular intervals.

A. H. Waychoff, Phoenix, Ariz.



Q. L. 3 Life of Straw or Chintz Scuffs Prolonged By Adding Soles Covered With Adhesive



Longer service can be had from light-soled straw or chintz scuffs by adding an extra sole consisting of cork or felt padding covered with moleskin adhesive and heavy adhesive tape. Trace patterns for the moleskin and adhesive tape directly from the scuffs and make the patterns for the padding $\frac{1}{4}$ in. smaller all the way around. Cut the padding from felt or $\frac{1}{16}$ -in. sheet cork and fasten to the scuffs with cellulose tape as shown. Then, cut out the moleskin and press it over the cork. Finally, cut the outer soles from chiropodist's heavy adhesive tape and press them carefully over the moleskin.

Nail Driven Through Floor Aids Locating Wire Hole for Wall Receptacle

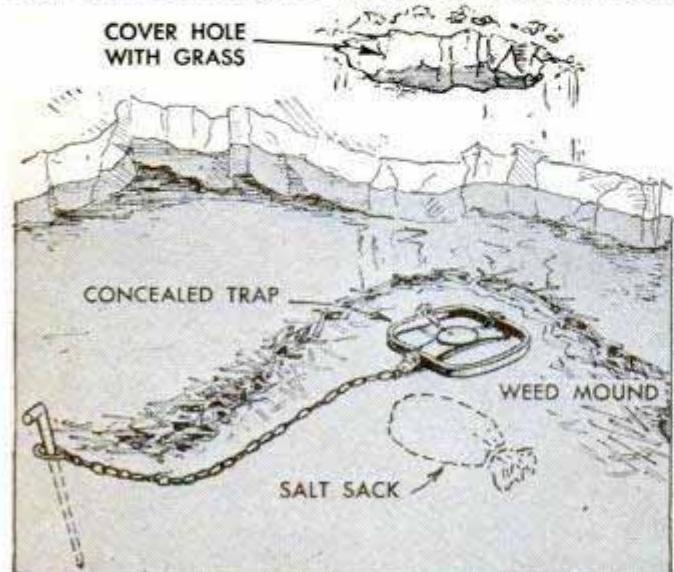
When bringing up wires from the basement to install a new wall receptacle on the first floor of a house, locating the hole to be drilled through the wall plate is simplified by driving a nail through the floor from above to serve as a guide. Using a long, thin nail, drive it through a crack between the floor boards as near to the base molding as possible and directly opposite the location of the wall receptacle. The

nail should not be driven completely into the flooring so it can be pulled without difficulty when the job has been completed. By checking the distance from the nail to the position of the hole upstairs and then measuring from the spot where the nail projects through the underside of the floor, it is a simple matter to determine the exact spot where the wire hole should be drilled.

P. R. Wilson, Brooklin, Ont., Can.

Salt-Filled Sacks Permit Under-Ice Muskrat Trapping in Coldest Weather

During zero weather when thick ice covers the backwaters of streams and marshes, it isn't necessary to give up muskrat trapping. The secret of successful under-ice trapping is in keeping holes in the ice open even in the coldest weather so the muskrats will come up to breathe. This can be

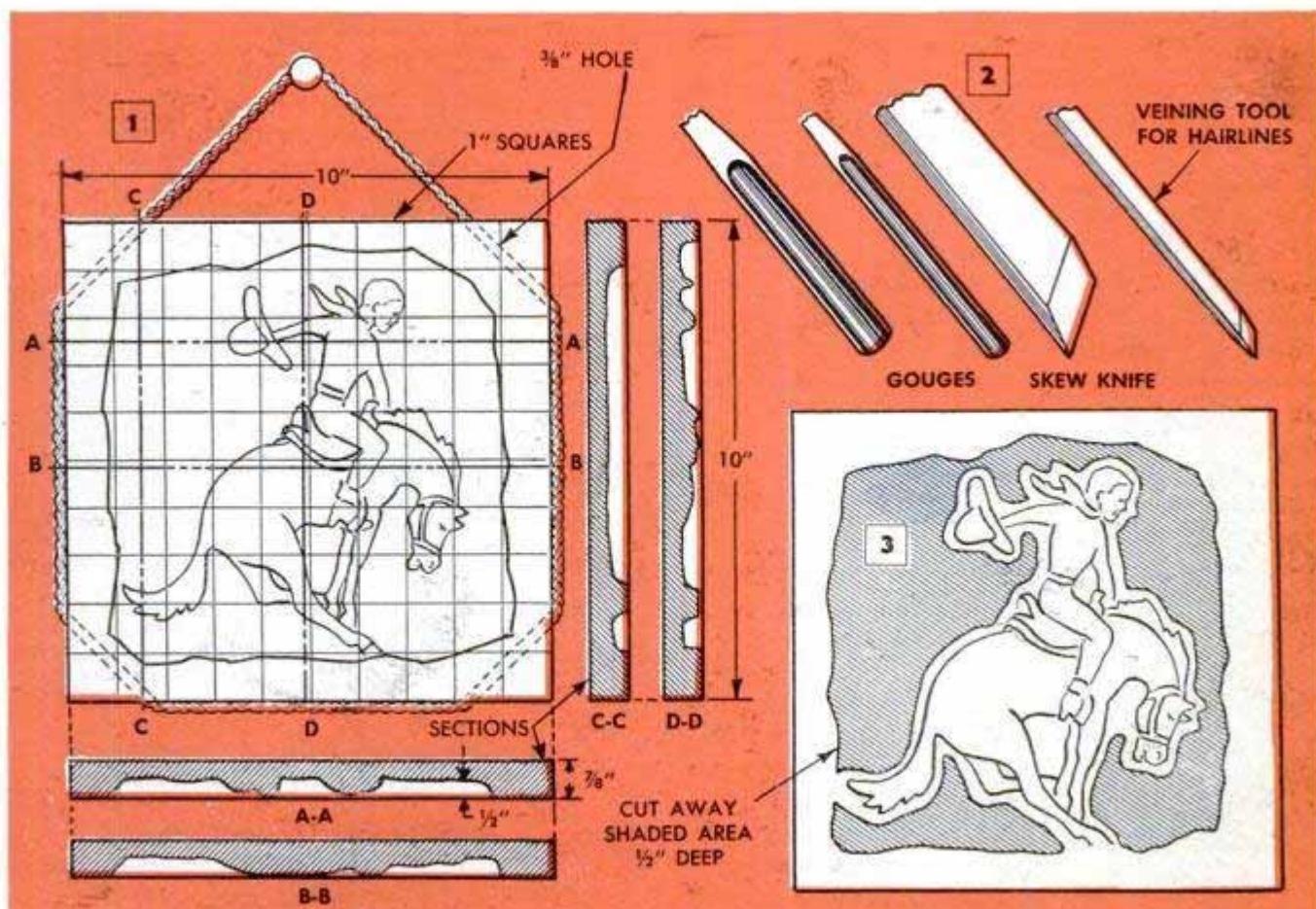


done with a salt brick of the type used for livestock. Break up the brick and place about a dozen small pieces in a cloth sack, using one sack for each set to be made. Select the locations for the sets near a muskrat house if possible and, for each one, chop a small hole in the ice where the water is not more than $1\frac{1}{2}$ to 2 ft. deep. Reach down into the hole and pull together a mound of water weeds so that the top of the mound is 4 to 6 in. below the underside of the ice. Bury the salt sack about 3 in. deep in the mound, directly beneath the hole and conceal a No. $1\frac{1}{2}$ underspring trap on top of the mound. The trap chain should be fastened to a stake which is pushed into the mud of the stream bed. The hole is covered with brush to protect it from the wind and cold, and the slowly dissolving salt rises to keep the hole from freezing over. Muskrats in the vicinity are sure to see the open holes and, when climbing the mounds, will be caught in the traps. Many minks also have been taken with this method.—R. A. Jenkins, St. Louis, Mo.

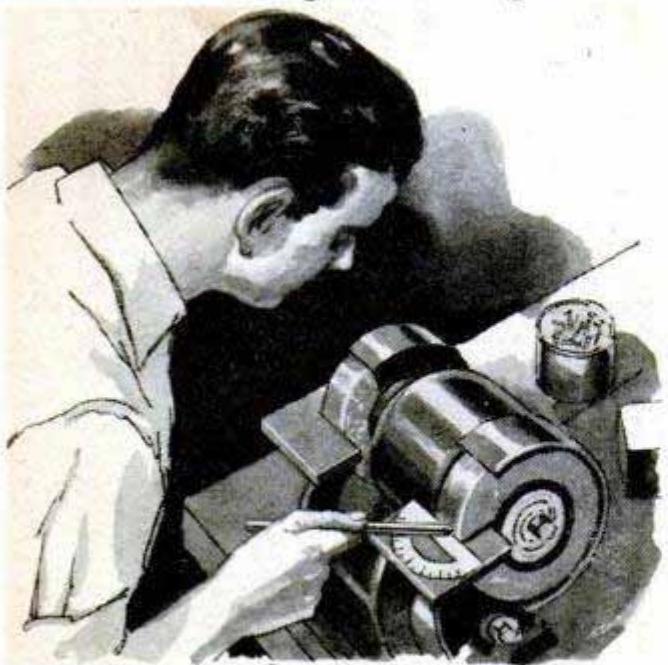
CARVED PLAQUE for your den

By **Hi Sibley**

A PLAQUE like the one detailed below is simple relief carving at its best. In wood carving of this type, the background is recessed with sharp hand tools, leaving a profile of the subject in relief. This is then rounded with short, paring cuts to form contours and shapes which are characteristic of the subject selected. Use clear white pine, or oak, and cut the piece to the size given in Fig. 1. Trace the outline on the wood, being careful to get it centered. Recess the background as in Fig. 3, removing the wood from the shaded area to the depth given with a wide carver's gouge, Fig. 2. Now, note sections A-A to D-D inclusive in Fig. 1. Begin with paring cuts and work in the rounded contours with skew knife, veining tool and small gouge. Relieve eyes, nose and ears with the veining tool and narrow gouge. Avoid long, single cuts which may go too deep and alter the contour lines of detailed parts. When the carving is complete, leave the wood unfinished. Hang the plaque on the wall at eye level with a $\frac{3}{8}$ -in. rope attached in the manner shown.



Protractor on Grinder Tool Rest Permits Checking Work Angle



When using a bench grinder for chamfering or pointing the ends of rod stock, the angle of the work can be checked at a glance by means of an inexpensive protractor cemented to the tool rest of the grinder. The protractor should be located so that its base line is at right angles to the surface of the grinding wheel.

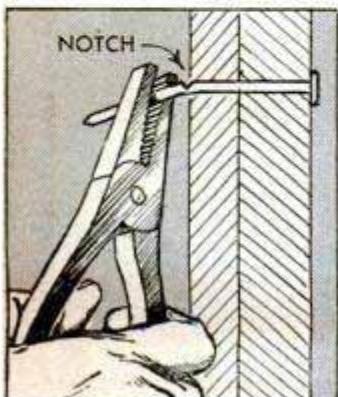
Measuring Fuel Oil in Storage Drum

A record of fuel-oil consumption can be kept easily if an accurately graduated measuring stick is used to gauge the amount of oil in the drum. The following table is for a 55-gal. drum, the graduations being painted on the stick starting at the lower end and working upward.

5 gal.	3 $\frac{1}{8}$ in.	30 gal.	11 $\frac{1}{2}$ in.
10 gal.	5 $\frac{1}{8}$ in.	35 gal.	13 $\frac{1}{16}$ in.
15 gal.	6 $\frac{7}{8}$ in.	40 gal.	14 $\frac{1}{16}$ in.
20 gal.	8 $\frac{3}{8}$ in.	45 gal.	16 $\frac{3}{8}$ in.
25 gal.	10 in.	50 gal.	18 $\frac{3}{8}$ in.

Edwin J. Rebman, Spokane, Wash.

Nails Notched for Easy Breaking

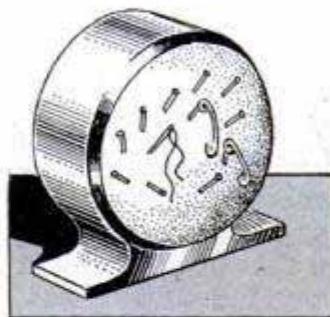


If long nails must be driven through thin pieces of wood, the protruding ends can be broken off easily if they are notched prior to driving. The thickness of the work is marked on the nail and a notch is filed

where the tip projects from the work. If the holes are to be filled for a finished job, the nail should be notched to break off slightly below the surface.

Alarm Clock Holds Pincushion

For a pincushion that can be carried conveniently and stood on end wherever it is needed, just insert an ordinary cushion in a discarded alarm-clock case. Remove the face and mechanism from the clock and place the pincushion inside, backing it with paper or cotton, if necessary, to hold it flush with the rim of the case.—Paul Criton, Kayville, Sask., Can.

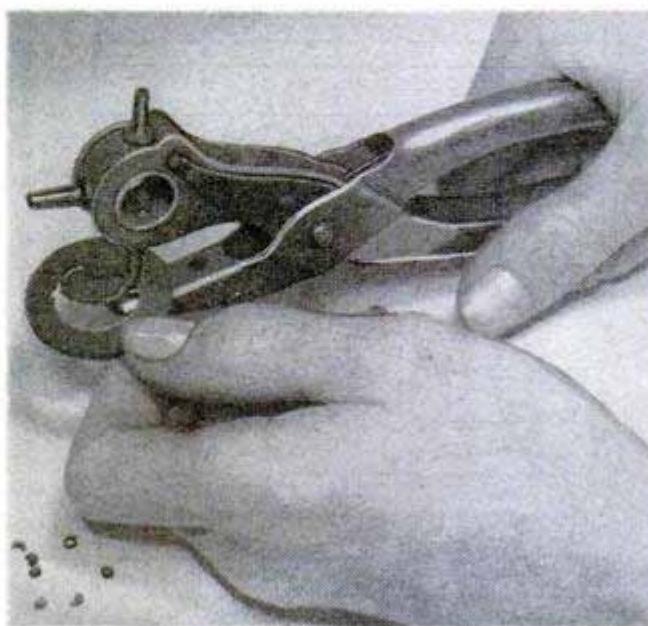


Tree Bark Serves as Compass

Should you be lost in the woods on a day when the sun cannot be seen, just look at the trees to find your bearing. Stand in a spot where the woods are equally dense all around and look closely in all directions. You will notice that the woods appear darker in one direction, which is south. This is due to the fact that the bark is thicker and darker on the north side.

Leather Punch Nibbles Holes When Making Gaskets

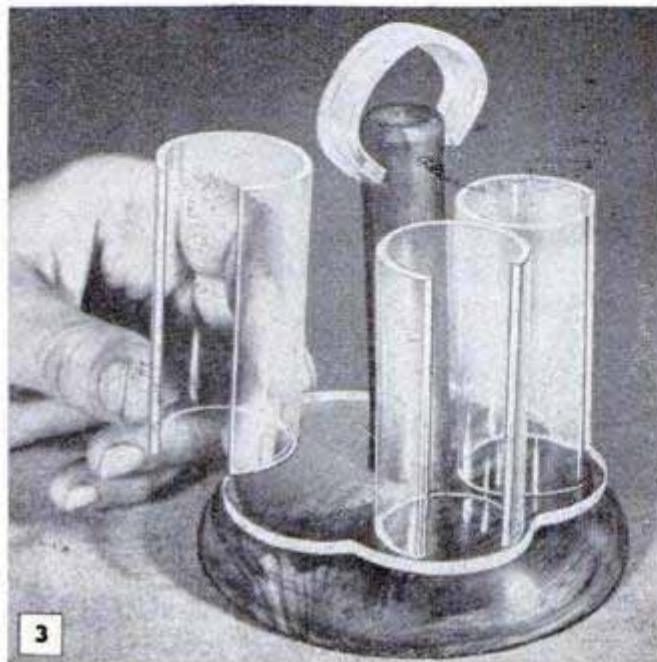
To cut holes in leather or rubber when making gaskets, try using a leather punch to nibble around the portion of the material to be removed. A guide line can be followed closely with the punch, and the result is a neat, accurate job even on irregular contours.



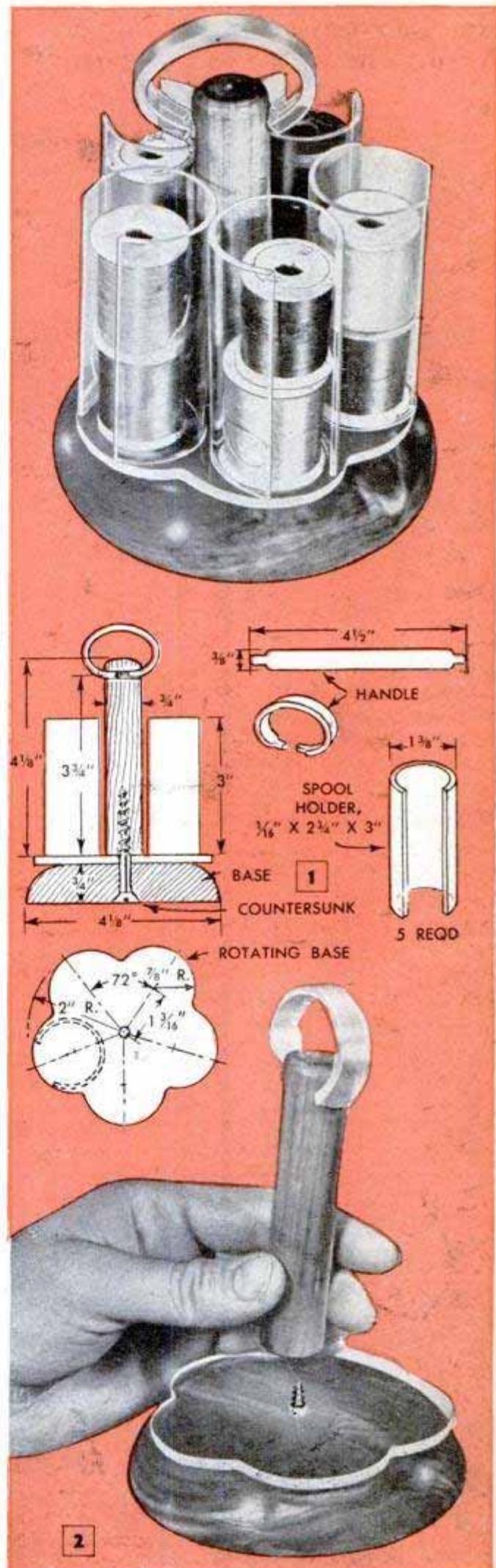
Rotating THREAD KIT

By Elma Waltner

WITH YOUR thread stored in transparent compartments which rotate with a touch of the finger, this novel sewing accessory makes it easy to spot the right color in a jiffy. The five thread compartments resemble a poker-chip rack and are made of $\frac{1}{8}$ -in. heat-forming plastic, such as Plexiglas or Lucite. Each one requires a piece $2\frac{3}{4}$ in. wide and 3 in. long. The protective paper covering is removed from the plastic and the pieces are placed in a kitchen oven at 250 deg. F. Heating makes the plastic pliable so that it can be formed into slotted cylinders by wrapping it around a wooden stick. Handle the plastic with cotton gloves to protect the hands and also to avoid finger marks in the softened material. The spool holders are cemented to a $\frac{1}{4}$ -in. plastic base that is laid out as in Fig. 1 and carefully cut to shape. A hole is drilled through the center of this piece for a screw on which it rotates. Except for the loop at the top of the handle, which also is made of plastic, the rest of the holder is made from scraps of choice hardwood. The base is turned according to the sectional view in Fig. 1 and is drilled in the center to take a flat-headed wood screw long enough to pass through the plastic and up into a $\frac{3}{4}$ -in. "dowel" handle. The screw is backed off slightly to permit the thread compartments to rotate freely. If desired, a thin washer may be placed between the wooden base and the plastic.



3

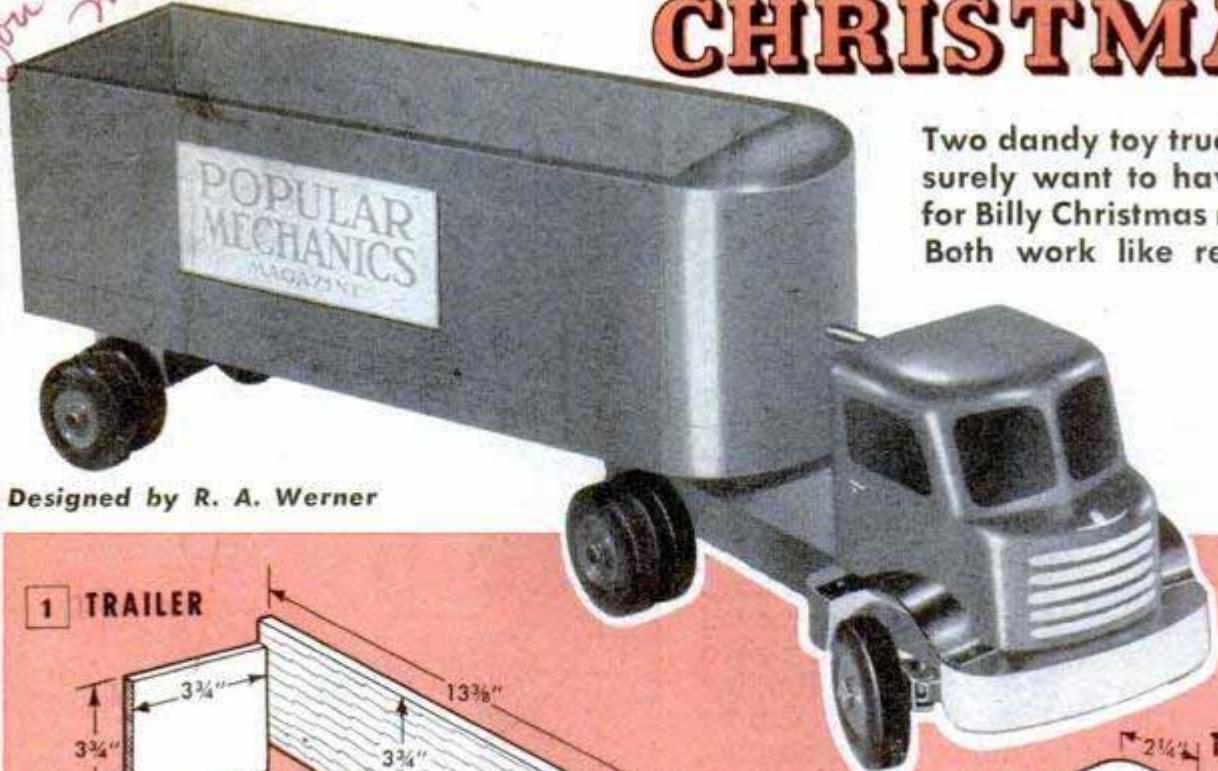


2

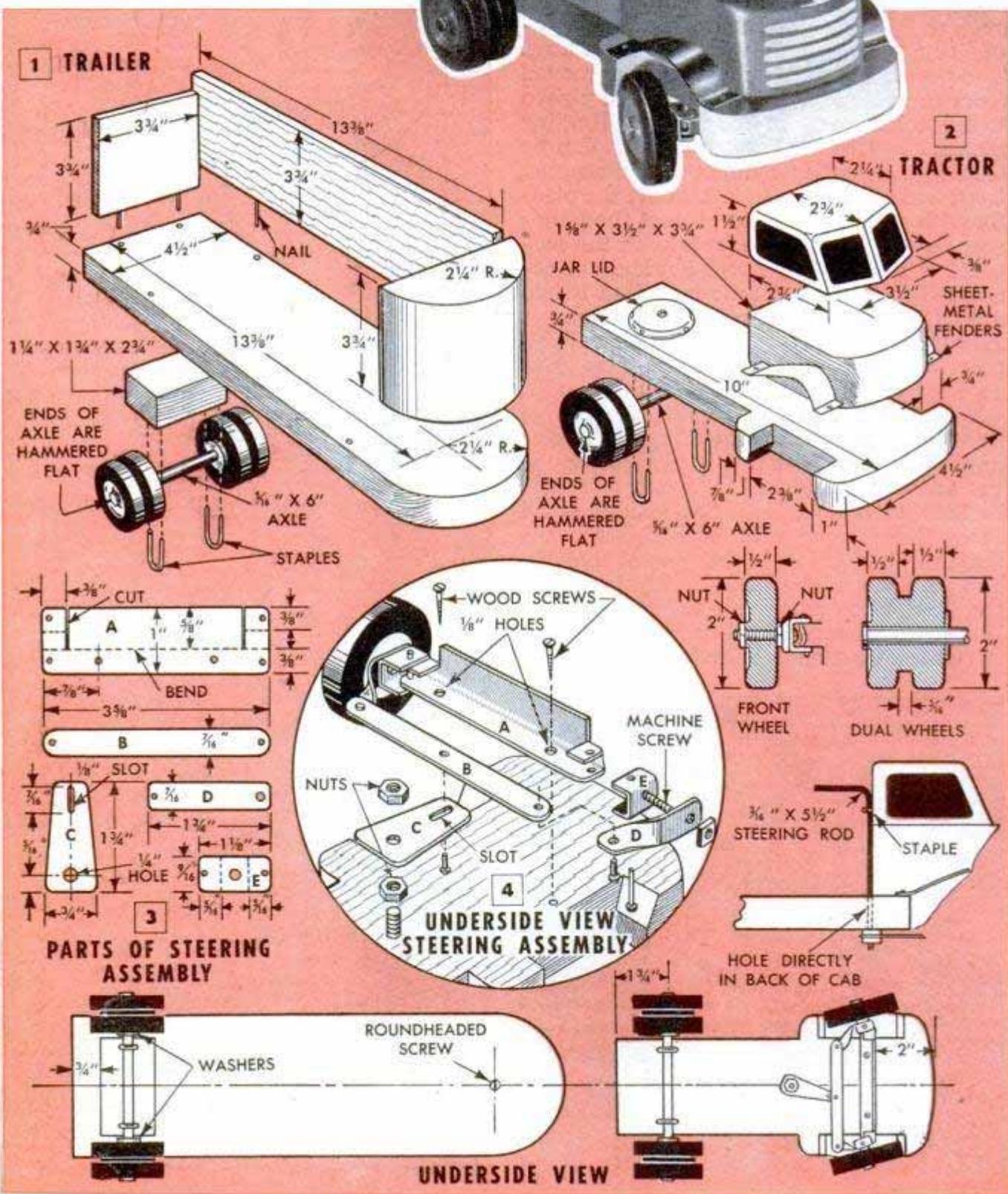
CHRISTMAS

Bo
Trucks
Toys you can make

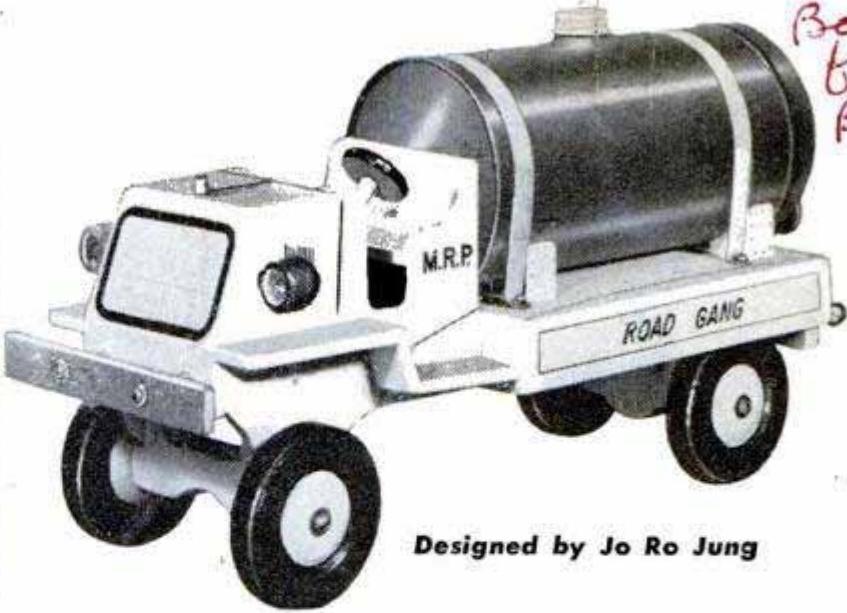
Two dandy toy trucks you'll surely want to have ready for Billy Christmas morning. Both work like real thing



Designed by R. A. Werner



TOYS



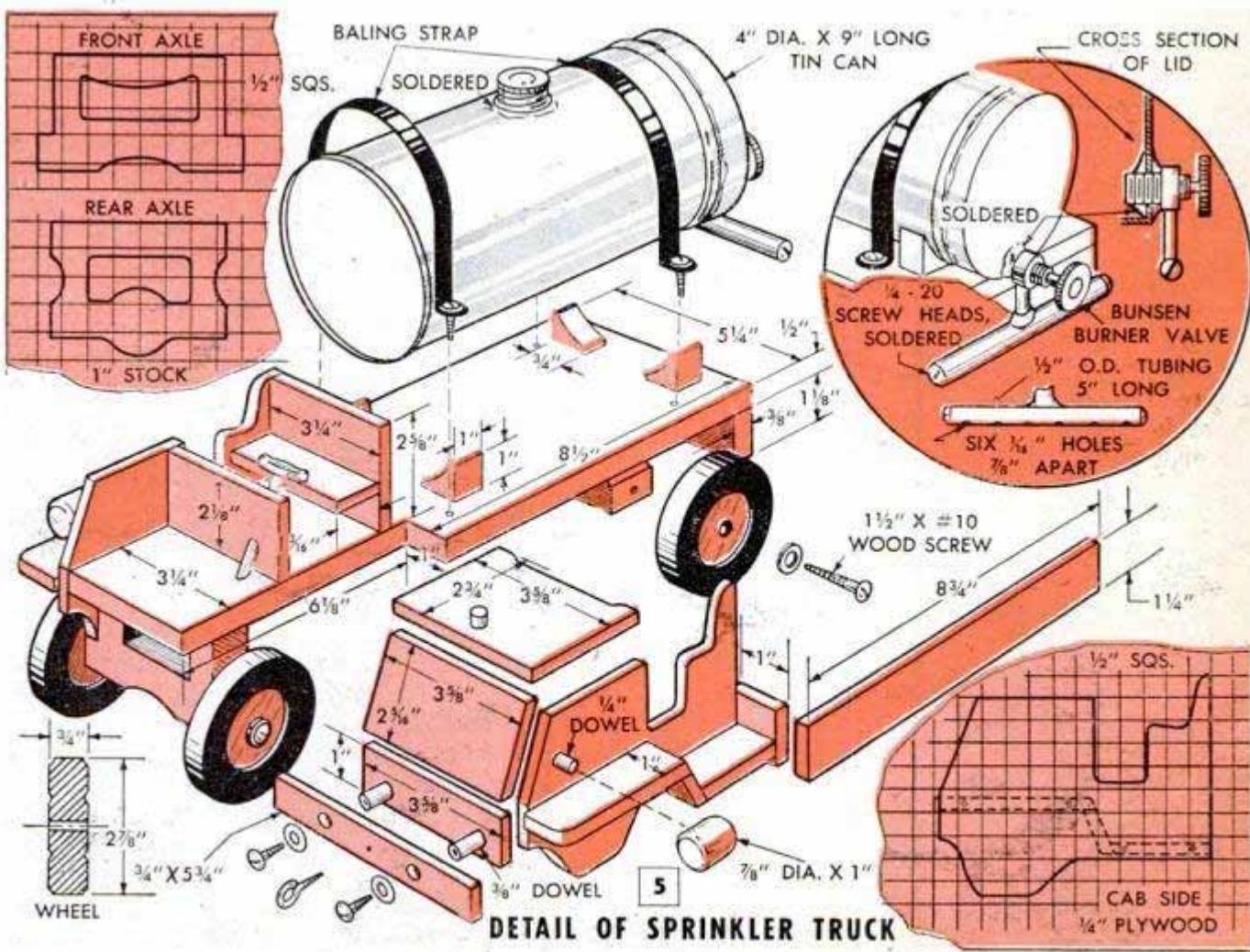
ONLY
Book
for
Boys

Designed by Jo Ro Jung

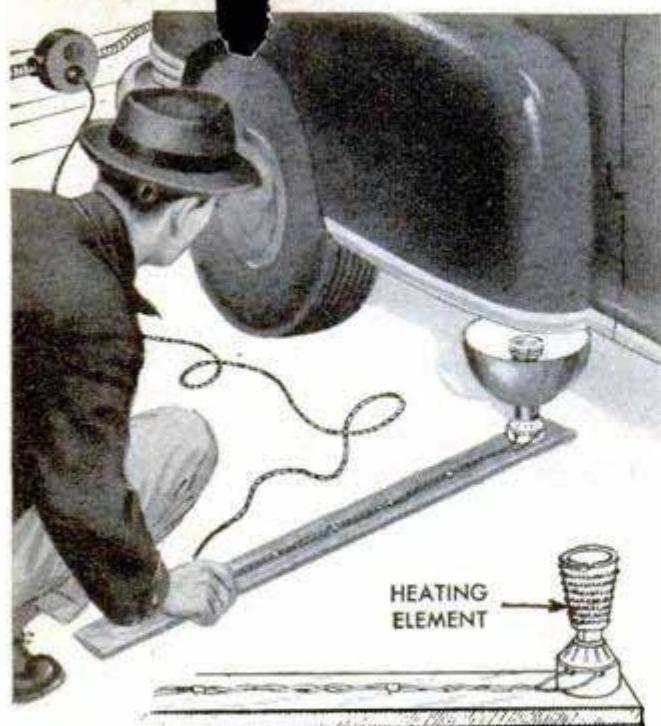
The trailer truck, detailed in Figs. 1 to 4 inclusive, actually steers like its prototype. The body of the trailer has removable sides and endgate, and couples to the tractor by means of a screw-and-jar-lid hitch. Fig. 3 shows the parts required for the steering gear, which are keyed with the assembly view, Fig. 4, to show where they go. Steering is done by an L-shaped rod located at the rear of the tractor cab and is connected to the steering gear by a slotted linkage. The wheels are lathe-turned from hardwood and the dual ones are peened on

$\frac{5}{16}$ -in. axles which are held with staples. Axles for the front wheels are machine screws, locked in place with nuts.

The sprinkler truck, while not steerable, actually sprinkles water. Assembly of the truck itself is apparent from the drawing in Fig. 5. The tank can be any suitable tin can such as a tall orange-juice can. The cover is soldered shut and a filler cap, taken from a 1-gal. turpentine can, is added. The valve for the sprinkler was taken from a discarded Bunsen burner. Punch a tiny hole in the filler cap to aid the flow of water.



Heating Element Warms Crankcase For Fast Cold Weather Starting



Even though a car is kept in an unheated garage, it will start quickly in the coldest weather if it is preheated with an electric heating element. The heating element is turned into a lamp socket mounted at the end of a 4-ft. length of board and an extension cord, wired to the socket, is plugged into a wall receptacle in the garage. A 10-in. photoflood reflector is used to direct the heat upward. Using the board as a handle, the heating unit is pushed directly under the crankcase and left in that position for 10 minutes or more. If you drive the car to work in the morning, it is a good idea to turn on the preheater before breakfast. Then, by the time you are ready to leave, the congealed oil in the crankcase will have been loosened enough to permit starting the car without delay. Before using the heater, take reasonable precautions to prevent the possibility of fire. Be sure there is not an excess of grease or oil on the crankcase where it will be too close to the heating element.

Cleaning Glass Drinking Straws

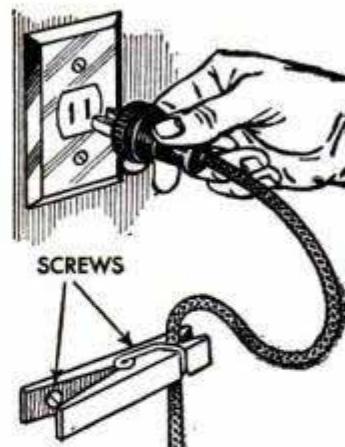


Ordinary pipe cleaners are just the thing for cleaning the inside of glass or plastic drinking straws, teapot spouts and similar surfaces which are difficult to clean thoroughly. The pipe cleaners should be

worked into both ends of the straws, after which the latter are simply rinsed in clear water and allowed to dry.

Clothespin Snubs Extension Cord

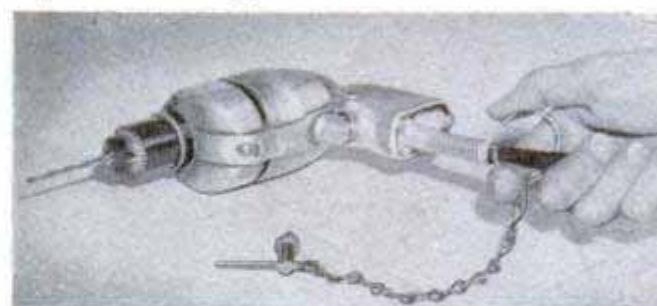
The extension-cord plug from a portable power saw or electric drill will not pull loose from a wall receptacle if it is snubbed with a spring-type clothespin. The pin is taken apart and one half screwed to the wall beneath the receptacle. Then, the pin is reassembled and the extension cord is clamped between the arms.—Georges Normandin, Shawinigan Falls, Que., Can.



Don't Blame Dust on Heating System

According to the National Warm Air Heating and Air Conditioning Association, your heating system is not responsible for dust in the home. Some of the dust filters through cracks around the interior trim and is brought in when people enter the house. However, most of the dust comes from textiles used in the home. It is possible to achieve efficient dust control with the warm-air winter air-conditioning system which filters the air before it is heated. Modern heating-system filters are capable of cleansing indoor air of about 85 percent of all airborne dust, dirt, lint and pollen.

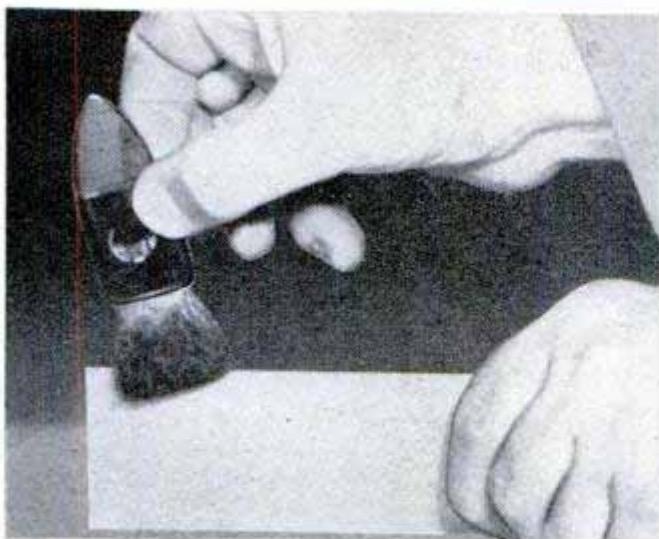
Prevent Mislaying Chuck Wrench By Attaching to Drill Cord



Mislaying the chuck wrench for a portable electric drill can be prevented by clipping the wrench to the extension cord before storing the drill. Attach the wrench to a ring taken from a loose-leaf binder, using a short length of lightweight chain, and snap the ring around the cord. When using the drill, fasten the ring around a belt loop or buttonhole so the wrench will not be lost.—Evan Wright, Topeka, Kans.

LENS CARE

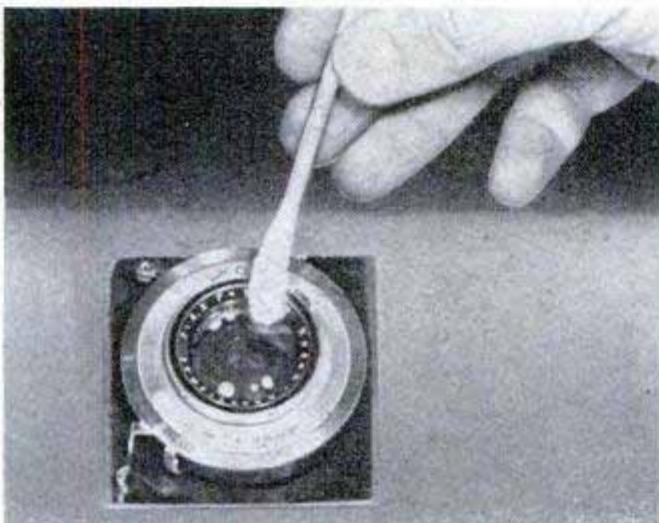
By H. Leeper



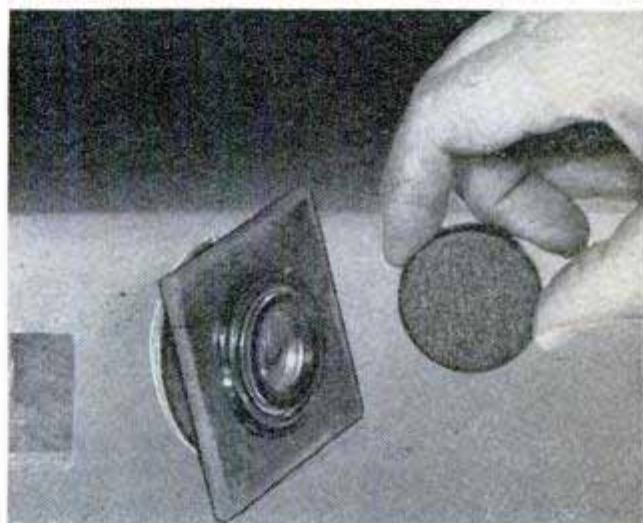
Before using a camel's-hair lens brush, clean it by brushing back and forth across the edge of a piece of cardboard as shown. This will remove dust and grit



After cleaning a lens with the brush, breathe gently on the glass, then dry it with tissue sold for this purpose. Use a light, circular movement of the tissue



Apply liquid lens cleaners sparingly, using a piece of cotton wrapped on the end of a nail stick. Use only the special cleaners made for this purpose



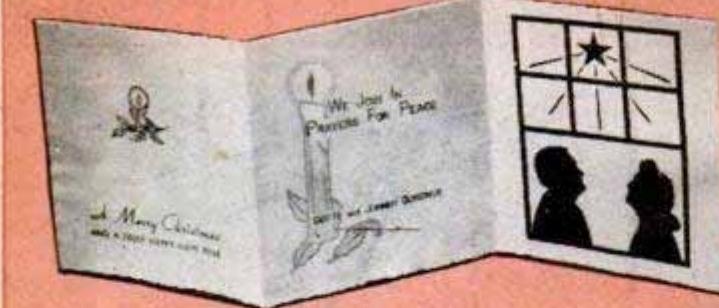
Cover lenses while not in use to protect them from dust and moisture. When not in camera, provide removable lens units with front and back covers

A small box with a locking lid is good protection for a lens assortment. Cover the lenses with soft padding such as that supplied with projection lamps



Lenses that are to be stored, carried in coat pocket or in camera carrying case should be protected by means of a chamois bag having a drawstring

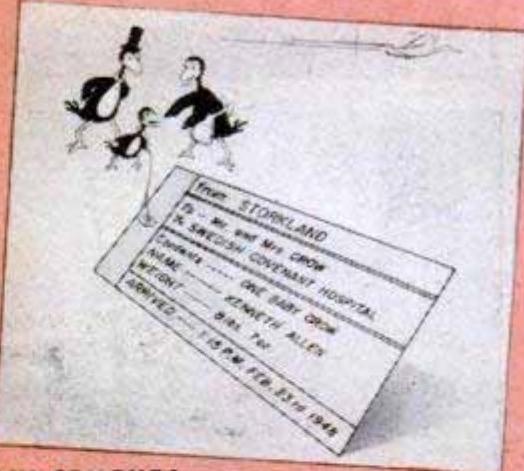




1



CHRISTMAS CARDS



ANNOUNCEMENTS



2



BOOK MATCHES

ENLARGER DOUBLES AS COPY

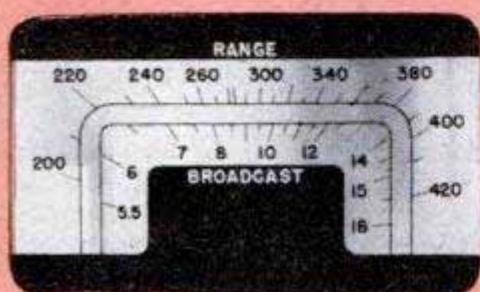
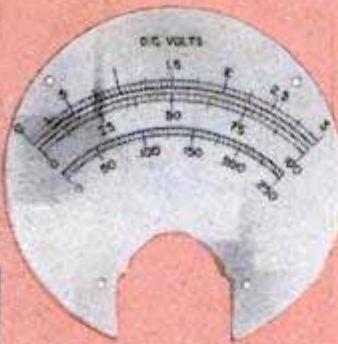
By Perry S. Graffam

THERE'S more to be had from an enlarger than just blowups. In many cases, this versatile darkroom accessory can be equipped at little cost to function as an efficient copying camera. All you need are just three items, a camera adapter back to slide between the bellows and lamp house of your enlarger, a pair of copying lamps and a homemade mirror attachment for viewing the ground glass and focusing, Fig. 8. The camera adapter back must be one that is made to fit your particular enlarger and you should buy two cut-film holders to fit it. The enlarger shown in Fig. 4 is a 4 x 5-in. Omega and takes the same type holder as that supplied with a Graphic camera. The copying lamps are made from a pair of gooseneck desk lamps. The ones that are fitted with C-clamps are the easiest to convert. Fig. 6 shows how the clamping brackets are altered by sawing on the dotted lines. The lamps are attached to the sides of the enlarger by fastening the brackets with small machine or thumbscrews. Being flexible, the lamps can be left permanently attached to the enlarger

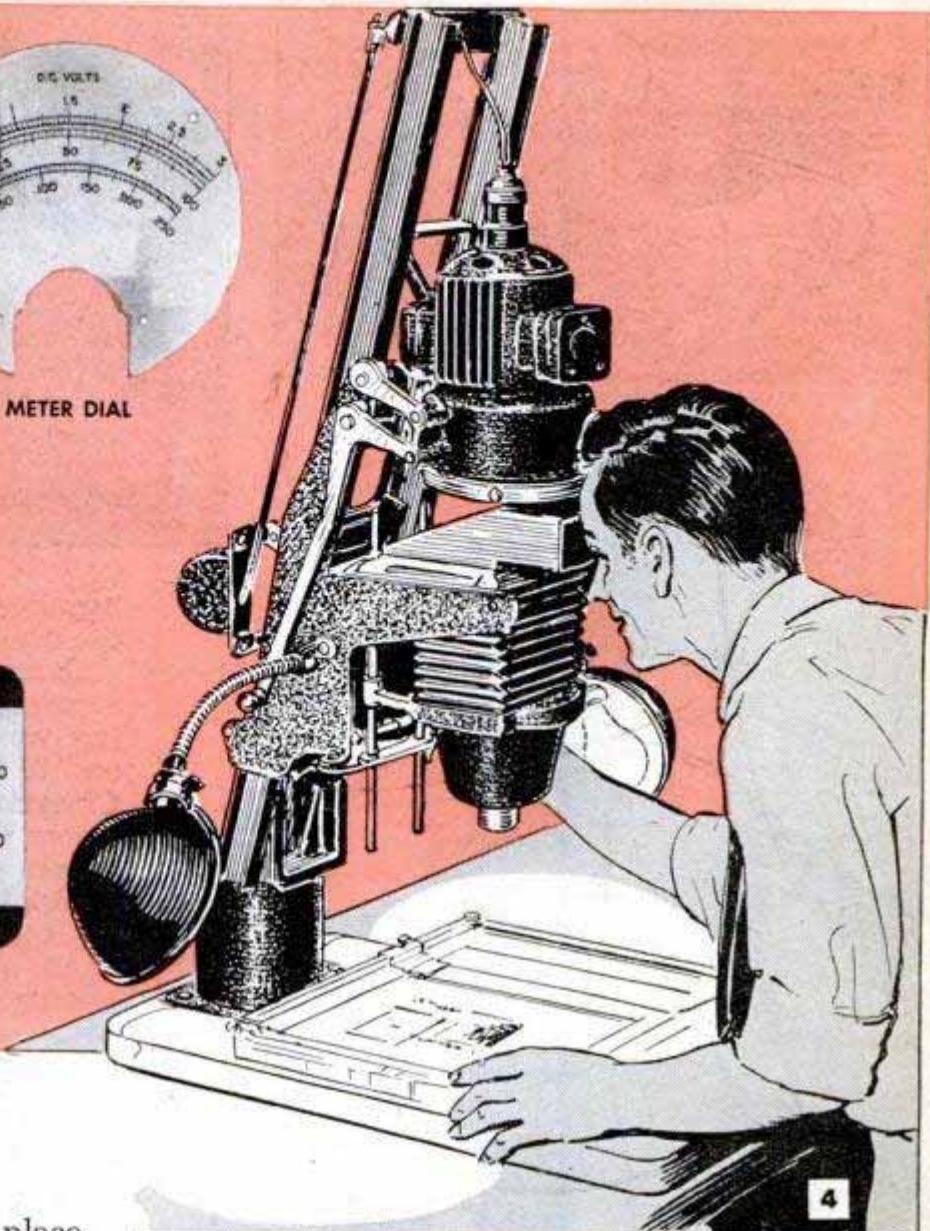
and swung out of the way. If the lamps are connected to a common plug, fit them with a plug that can be distinguished readily from the one on the enlarger. No. 1 photo-floods or regular enlarger bulbs can be used in the lamps. The latter are less brilliant and permit more latitude in making exposures.

The periscope viewer which rests on top of the adapter back can be made of wood, metal or cardboard. The sides of the original were of wood and the top and nose-piece of cardboard. As the size of the viewer must be made to fit the head of the particular enlarger, no dimensions are given. A piece of mirror is mounted in the viewer at a 30-deg. angle, as shown in Fig. 5, and the inside of the viewer is painted dull black to eliminate light reflections. The ground glass on the adapter back is marked off in 1-in. squares. Rule the lines on the glossy side of the glass, using a draftsman's ruling pen and India ink.

The viewer and adapter back are placed in the enlarger by removing either the lamp house or the condenser lenses. The lenses were removed from the enlarger pictured in Fig. 7. Three thumbscrews



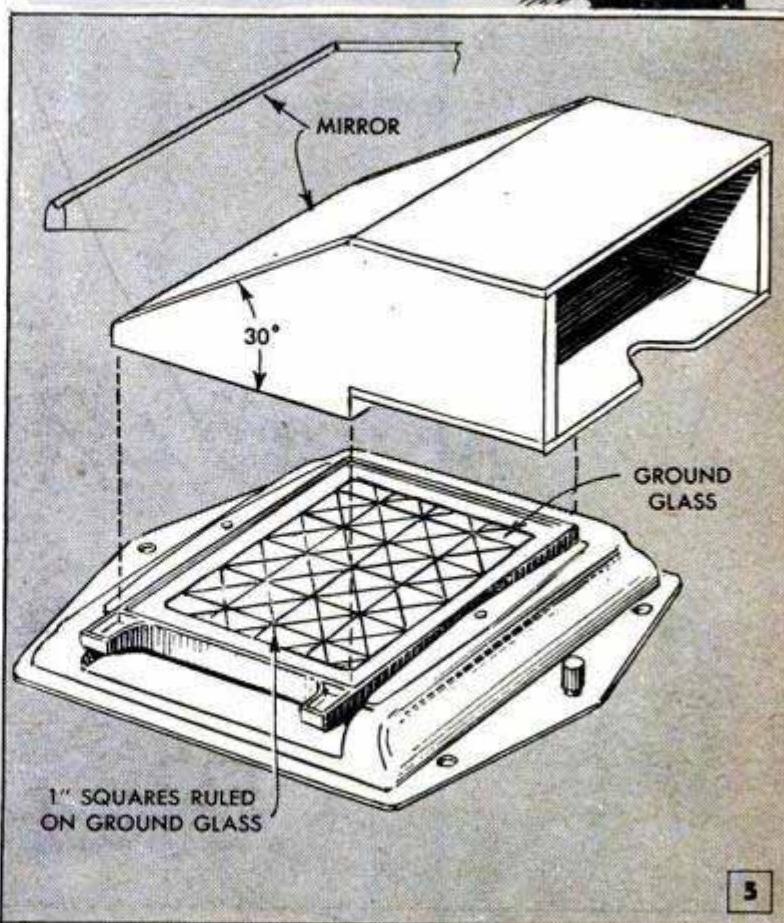
COMMERCIAL COPY

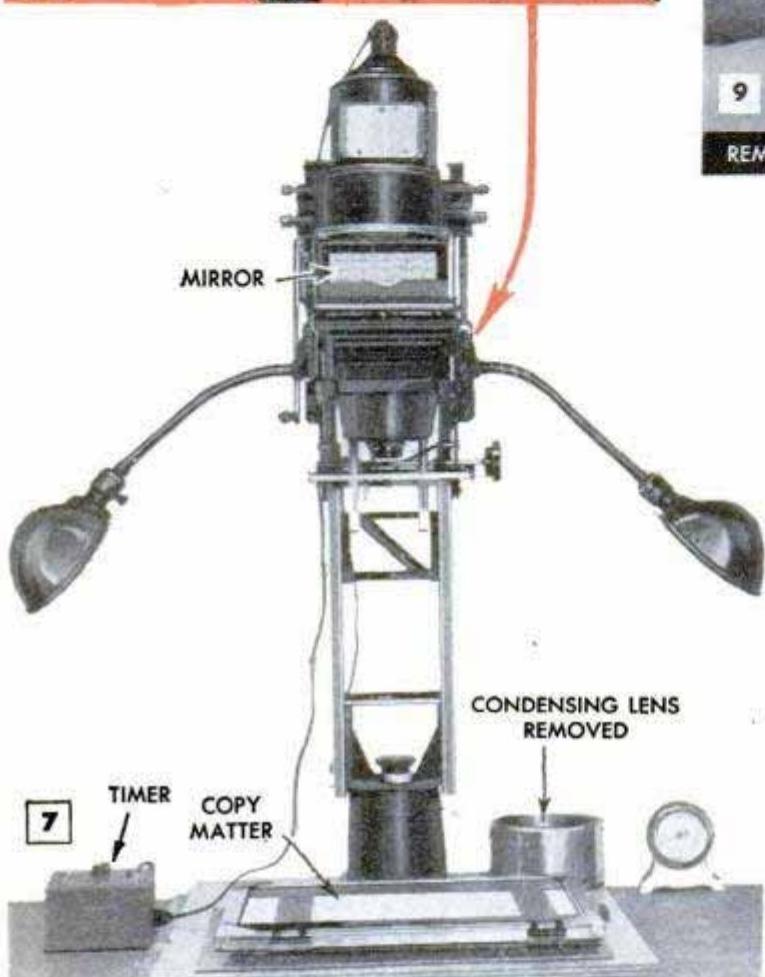
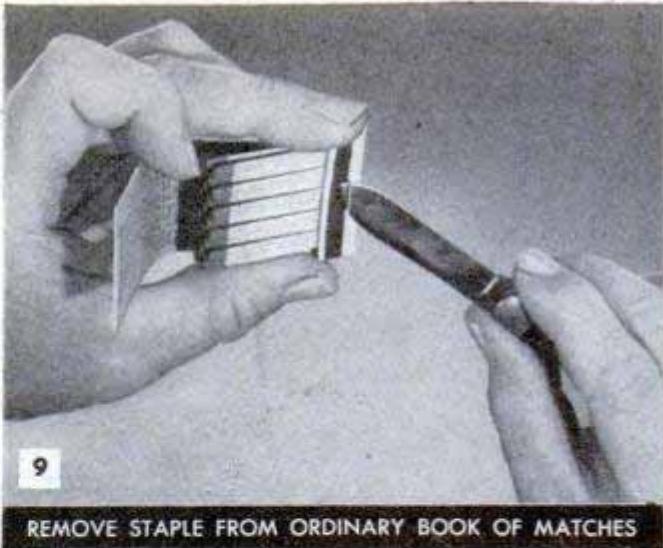
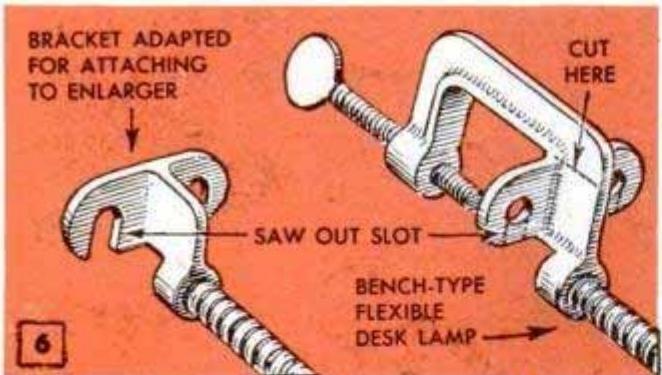


CAMERA

usually hold the lenses in place. The adapter back is placed over the open end of the bellows and the viewer goes on top of the adapter. The enlarger is now set up to make copy negatives.

To make a copy negative, place the material to be copied on the enlarger easel. With the lens aperture opened all the way, peer into the viewer and focus the copy sharply on the ground glass, bringing it to the desired size. With this done, slip a loaded film holder in the adapter. Now you are ready to make the exposure, much the same as you would with a camera. Set the aperture of the enlarger lens at its smallest opening, pull the slide from the film holder and turn on the copying lamps. Several test negatives usually will have to be made to obtain the correct exposure the first time. If super-XX film is used and the lens opening is set at f:32, an exposure of from five to seven seconds is suggested. From here on, the





negative is processed and printed in the usual manner.

Examples of what you can do with your enlarger when set up for copying work are shown in Figs. 1, 2 and 3. These include birthday and Christmas cards, birth announcements, personalized match-book covers and numerous types of commercial copy, which can be produced by copying photos and drawings from magazines, actual retouched photographs, etc. In fact, there's little that cannot be copied, the only limitation being the area your enlarger will cover. The Christmas card pictured in Fig. 1 was made with three negatives. The printed verse was copied from an old Christmas card and the third negative was made by shooting a couple silhouetted against a sheet brightly lighted from behind. A print was made of



out of
Business
3/51

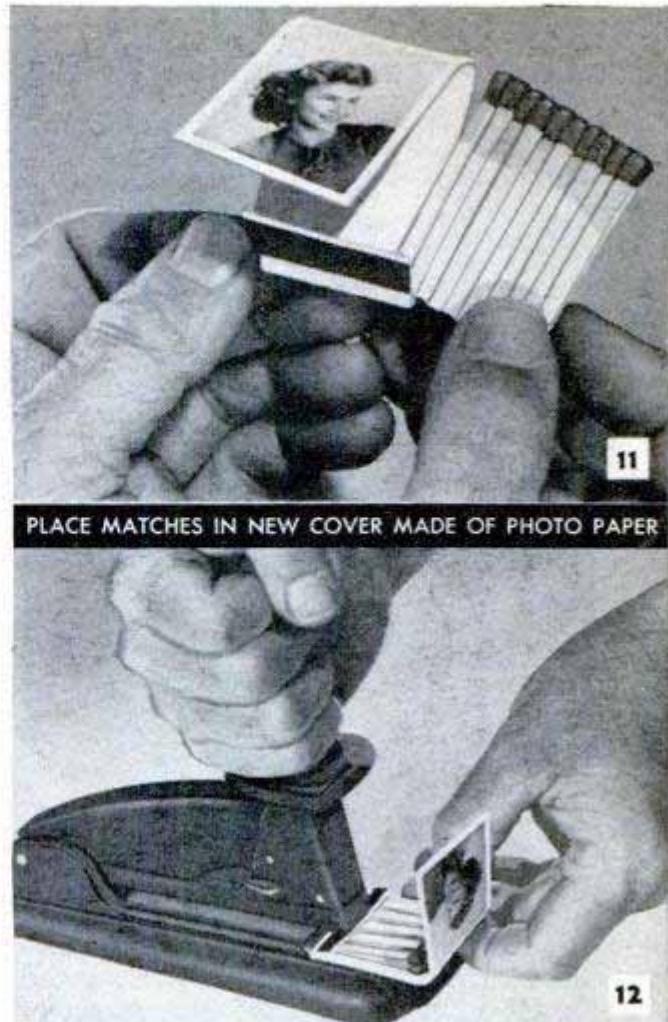


10

TAKE OUT MATCHES AND DISCARD COVERING

the third negative, and the images cut out and pasted on a drawing of a window and star. This composite print was then placed on the enlarging easel and copied. The complete card was printed at one time by taping the negatives in position in a contact printer. Finally, the candles were hand-colored. The second card pictured in Fig. 2 also was made from a composite, the card featuring on the cover how the scene pictured on the inside was made.

Personalized match-book covers are fun to make. First a copy negative is made from the photo or sketch you plan to use and then it is printed or enlarged on double-weight paper slightly larger than the finished size of the cover. After this, each personalized cover is applied to commercial book matches by simply pulling out the staple, Fig. 9, removing the matches, Fig. 10, and then replacing them in the new



11

PLACE MATCHES IN NEW COVER MADE OF PHOTO PAPER

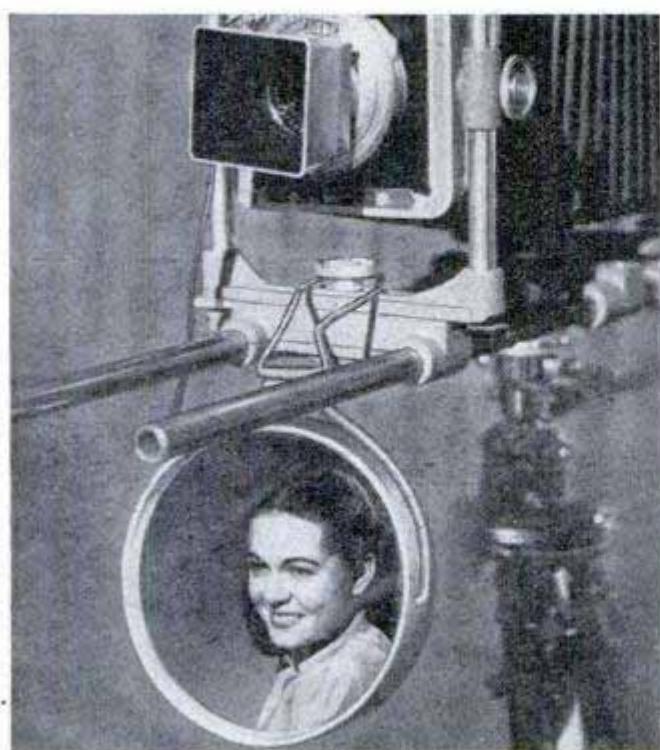


12

FASTEN MATCHES TO NEW COVER WITH STAPLE

cover, Fig. 11, and finally restapling as in Fig. 12. A prepared striking-surface liquid can be purchased for coating the new covers and a simple jig can be improvised to facilitate applying the solution neatly.

Mirror Mounted on Front of Camera Puts Portrait Subject at Ease



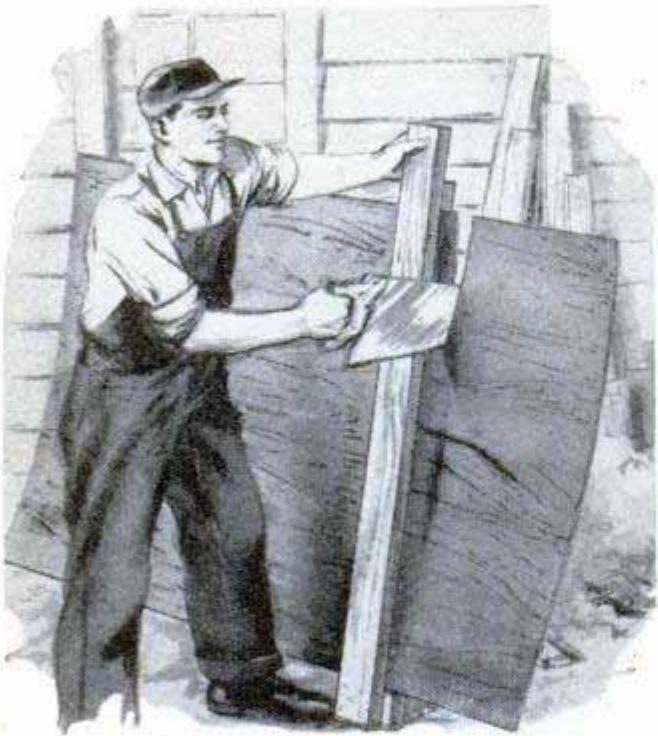
Especially helpful when taking portraits of women, a mirror mounted on the front of the camera will give the subject more confidence and is handy for last-minute primping. Just hang a shaving mirror as shown in the photo so the subject can see for herself how she looks before the camera.—Virginia Hanson, Santa Monica, Calif.

Cushion for Photoflood Reflector

To protect the filaments of photoflood bulbs, slip a rubber ignitionable nipple over the top section of the light stand. This cushions the shock if the top section accidentally drops into the lower one.



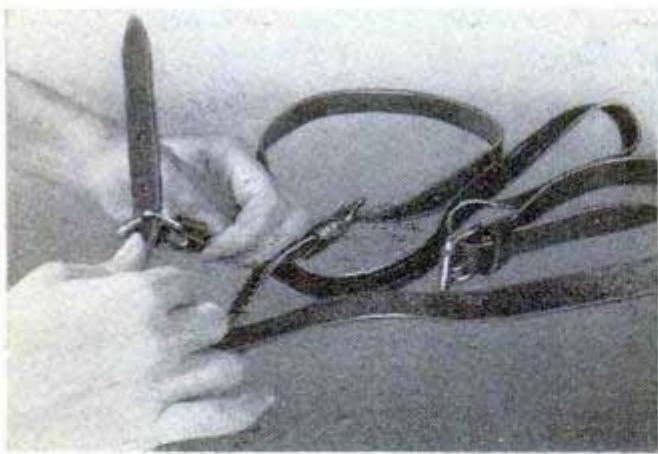
Brace Across Cupped Plywood Aids Sawing Large Sheets



Two blocks nailed to one side of a 2 x 4 provide a convenient holder for sawing plywood that will keep the work from flexing and vibrating. The blocks are spaced slightly closer together than the width of the plywood sheet. The latter is bowed and wedged between the blocks as shown in the illustration, the resiliency of the material holding it in place.

G. E. Hendrickson, Argyle, Wis.

Lengthening Leather Straps



Long leather straps often needed for lashing trunks and luggage in place, can be made by merely buckling together several short straps to obtain the desired length.

Ear Muffs Provide Pincushion

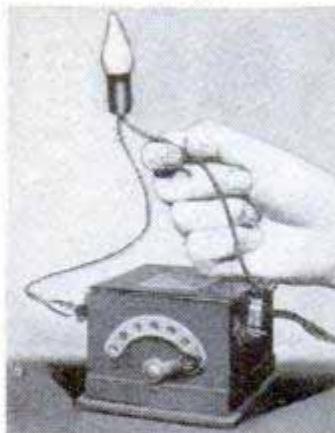
A pair of spring-type ear muffs slipped over the shoulder serves as a handy pincushion that can be carried right along with you while sewing. The pincushion is

out of the way but always within easy reach of either hand.

Benj. Nielsen, Aurora, Neb.

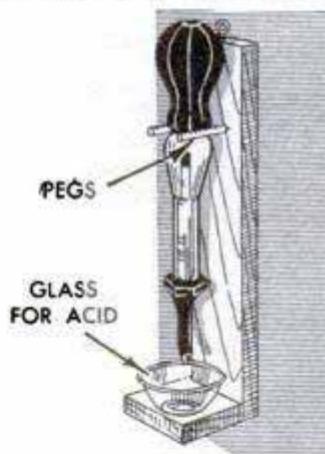
Testing Christmas-Tree Lamps

If a toy-train transformer is available when arranging the Christmas-tree lights, you'll find it a handy aid in testing the individual lamps. Fasten battery clamps to the wires of a lamp socket cut from a discarded string and attach the clamps to the low-voltage terminals of the transformer. With the first lamp in the socket, gradually advance the rheostat until the proper brilliance is reached. Then use this position for testing the remaining lamps.—H. Leeper, Canton, Ohio.



Wall Rack for Battery Hydrometer

Though it is convenient to store a battery hydrometer by hanging it on a wall, acid dripping from the spout is likely to damage clothing and equipment. This wooden wall rack collects the drops of acid in a glass dish or jar placed directly under the spout of the hydrometer. The wood is protected with an acid-resistant coating of melted wax.—H. Zave, Chicago.



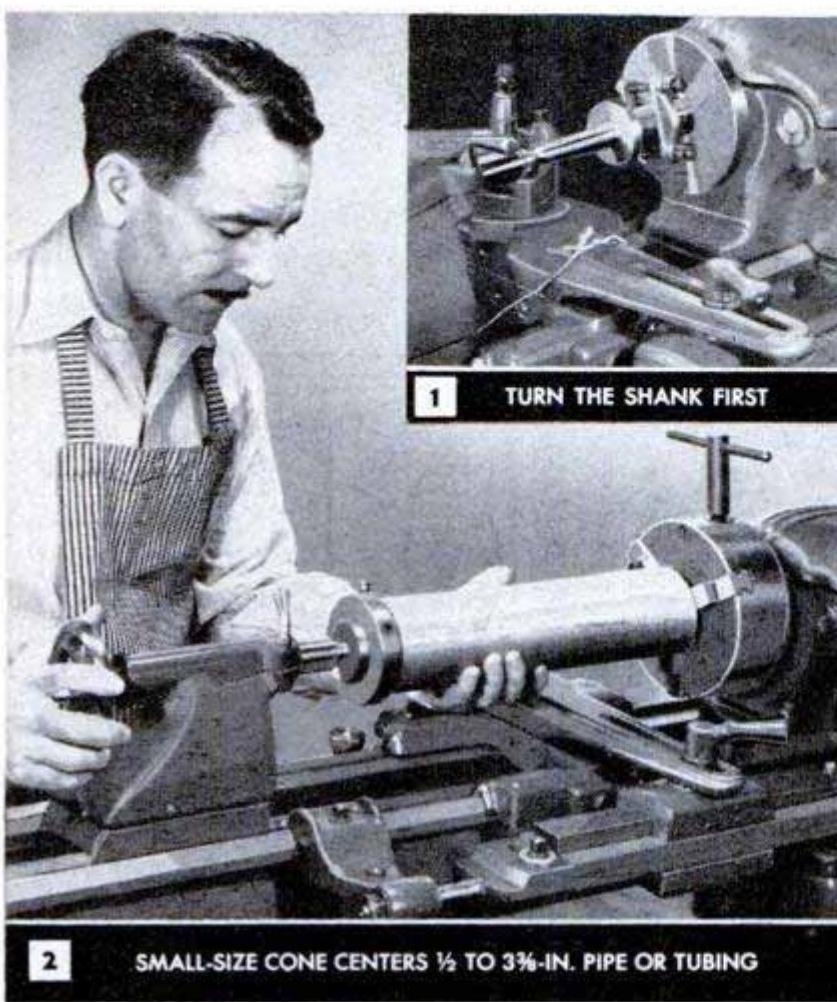
Rubber Band Fastens Key to Wrist

When coming home late at night or with your arms full of bundles from a shopping trip, you can save the trouble of searching for the door key if you previously fasten it to your wrist with a rubber band. At a convenient time, slip the rubber band through the hole in the key and insert your hand through the loops.

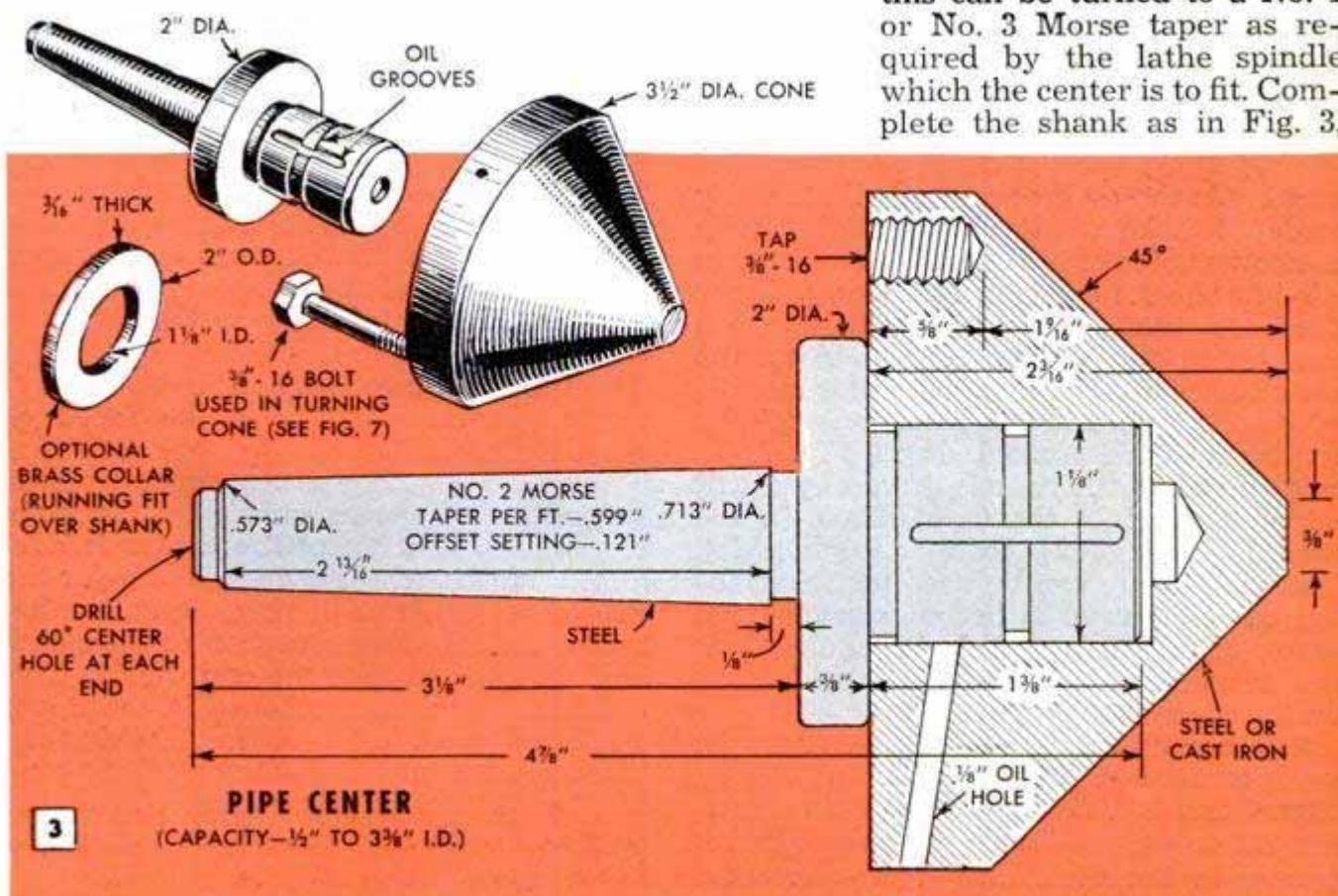




SHOP NOTES



2 SMALL-SIZE CONE CENTERS $\frac{1}{2}$ TO $3\frac{3}{8}$ -IN. PIPE OR TUBING



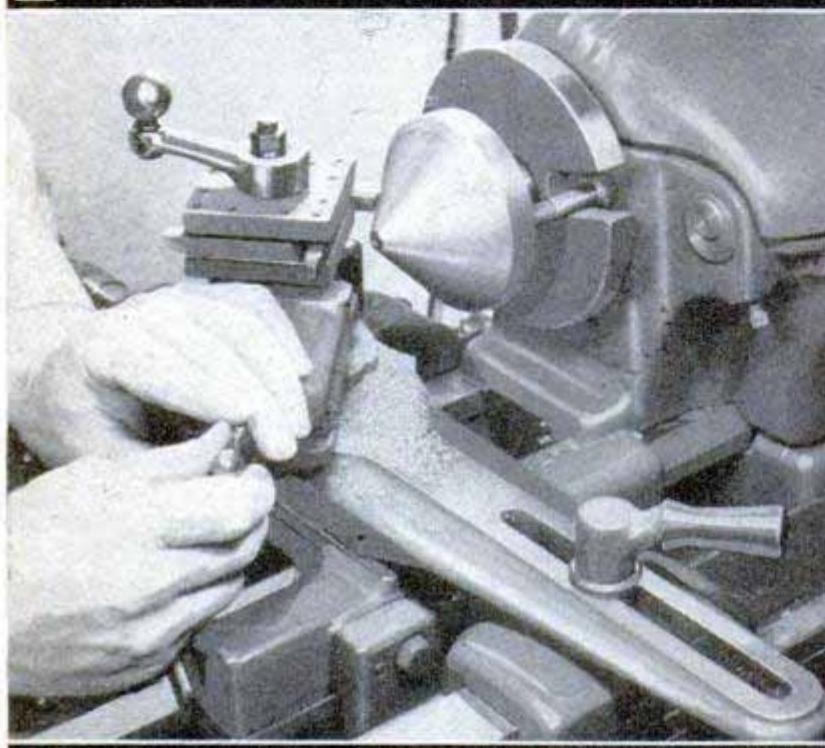
LATHE PIPE CENTERS

By Sam Brown

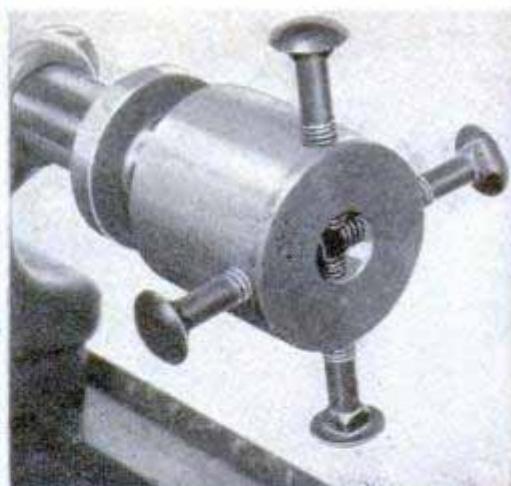
SMALL job shops and individual craftsmen having only infrequent use for pipe centers can save both money and setup time by making one or a pair to handle those occasional jobs requiring the turning and threading of tubing or pipe in the lathe. The individual center consists of two parts, Fig. 3, a shank and a cone. Stock for the shank is faced to the net length and center-drilled. Then the shank is mounted between centers and the taper turned as in Fig. 1. Fig. 3 gives the specifications for a No. 2 Morse taper but this can be turned to a No. 1 or No. 3 Morse taper as required by the lathe spindle which the center is to fit. Complete the shank as in Fig. 3,



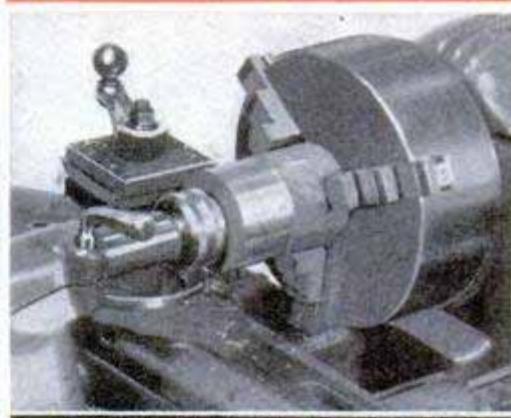
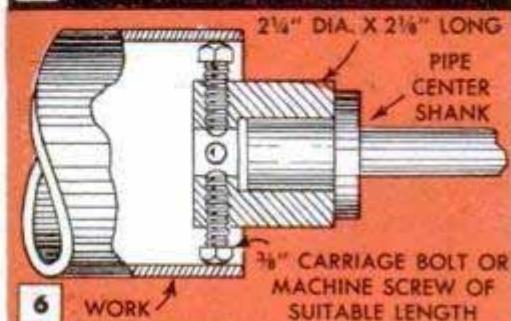
4 CONES AND OTHER FITTINGS ARE BORED TO TAKE SHANK



7 BOLT IN SLOT OF FACEPLATE ROTATES CONE WHEN TURNING TAPER



5 EXPANDING PIPE CENTER



8 BALL-BEARING CENTER IS USED WHEN TURNING DOWN SMALL WORK

turning in the oil grooves and oil reservoir as detailed. Break, or chamfer, all corners as shown. Stock for the cone is mounted in a 3-jaw chuck for facing and boring. Check the bore diameter frequently to assure a running fit on the shank, Fig. 4. After the cone has been faced and bored, it is mounted on the shank in the headstock spindle for turning the conical shape, Fig. 7. In this operation the cone is driven by a bolt which turns into the tapped hole in the cone, Fig. 3, and engages the faceplate slot. The same setup can be used for resurfacing the cone after it becomes scored and worn. If the work is likely to require their use, larger cones can be made up for use on the same shank.

Another useful fitting for pipe and tube work in the lathe is the expanding center, Figs. 5 and 6. This unit is bored to a running fit on the pipe-center shank so that it rotates in the same manner as the cone.

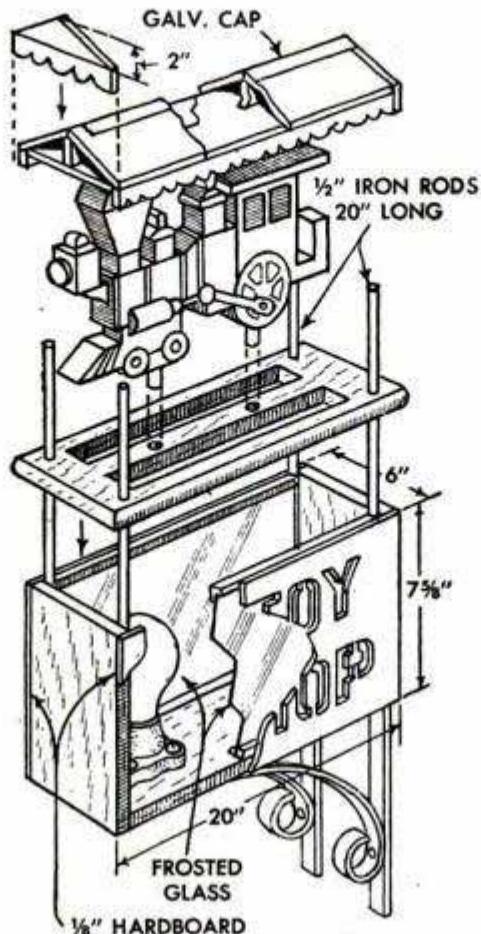
The bolts, equally spaced around the circumference of the unit, are turned in sufficiently to allow the center to be slipped inside the end of the tube, or pipe, as in Fig. 6. Then, by backing out the bolts, the tubing can be centered and held securely. This type of center is especially adapted to use on work which must be faced or threaded in the lathe.

Work done with pipe centers normally is turned at slow speeds and for this the plain, sleeve-type bearing of the center is adequate. However, some operators favor the use of an antifriction ring, or collar, between the shouldered section of the shank and the cone to take the end thrust. This optional part is dimensioned in the upper left-hand detail in Fig. 3. Small tubing can be supported on a ball-bearing lathe center, Fig. 8. This is a standard lathe accessory and ordinarily is used for supporting heavy work.

A real attention-getter for most any small store, but especially suitable for a gift or toy shop, this illuminated sign displays a brightly lighted cutout of the merchant's specialty. It's just the thing to attract evening shoppers during the holiday season. The lower portion of the sign, or lamp house, is made like a box, using solid stock or waterproof plywood for the ends, bottom and top. The sides are sheets of $\frac{1}{8}$ -in. hardboard. The name to be illuminated is jigsawed in both sides of the box and any remaining surface on the hardboard may be decorated with a painted monogram or design. The sides are backed with panels of frosted glass held in place with strips of quarter round at the bottom and a rabbed molding along the top edge. Two lamp sockets mounted on the

bottom of the box are wired to a switch inside the store. Parallel slots cut in the top of the box permit illuminating both sides of the cutout. The latter can be a simple design jigsawed from plywood or a more elaborate one carved in relief from solid stock. A plywood canopy fitted with a ridge cap of galvanized sheet metal is supported by four $\frac{1}{2}$ -in. iron rods. The latter are set in blind holes, drilled at the corners of the

Attractive Illuminated Sign for Small Shop Displays Cutout of Merchant's Specialty

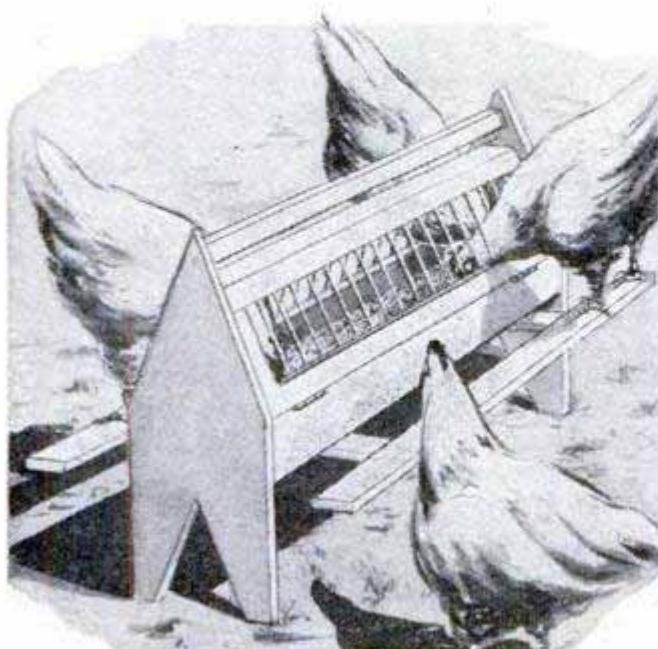


bottom of the box, and project through holes in the top. To facilitate renewing the light bulbs inside the sign, do not attach the slotted top permanently to the lamp house. In this way, the entire upper portion of the sign can be lifted off. Paint the sign to suit, using a reflecting paint on the inside of the box, and mount it on the side of the building with appropriate metal brackets.—Hi Sibley, Nuevo, Calif.

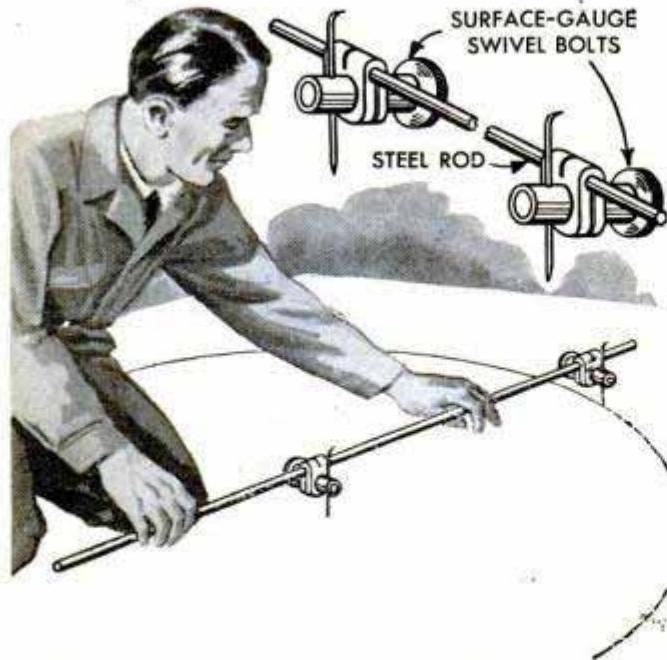
Grids on Poultry Self-Feeders Prevent Feed Waste

Poultrymen troubled by undue feed waste when flocks are put on range or are started on new rations, can profitably equip self-feeders with special grids which permit the chickens to reach the feed easily but prevent them from billing it out of the hoppers. The grids consist of wooden frames fitted with equally spaced crossbars of heavy wire, or dowels, and hinged to the top edges of the hopper. The frames close against a horizontal strip nailed between the ends of the hopper. Hooks or latches are provided to keep the grids closed.

To keep paint from clogging the bristles of a new paintbrush, dip the brush in linseed oil before using.



Scriber Heads Serve as Trammels For Improvised Beam Compass

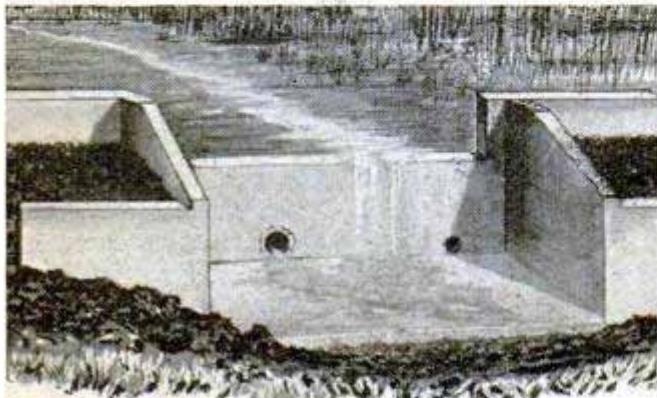


Having only occasional need for a large beam compass, one layout man quickly improvises a serviceable compass by using the scribe heads from two surface gauges as trammels. These are slipped onto a polished steel rod of the correct diameter and length. The heads are adjusted on the rod to strike the radius desired and the scribes are turned with the straight points down and locked in place with the swivel screws, or bolts. In cases where a pencil mark is required, a small-diameter pencil of the type supplied with bridge score tallies can be sanded down to fit the scribe hole in one of the heads.

Charles W. Adams, Waterloo, Ont., Can.

Erosion of Planted Fields Prevented By Concrete Dam and Spillway

On many farms, surface water from a heavy rainfall is brought down from higher levels through sloping, cultivated fields on grassed waterways. These usually lead to some natural drainage point, such as a stream or roadway. However, unless the flow can spread and drain away slowly at the point where it leaves the grassed



waterway, it may form a deep ditch through which tons of valuable topsoil will be carried away during a single downpour. One farmer, confronted with this problem, built a concrete spillway with wide wings to contain the flow and spread it over a wide area. Thus the backwaters drain away slowly over the spillway. Tile lines, opening into the bottom of the spillway, extend back into the field to drain away the water remaining after the level falls below the top of the spillway.

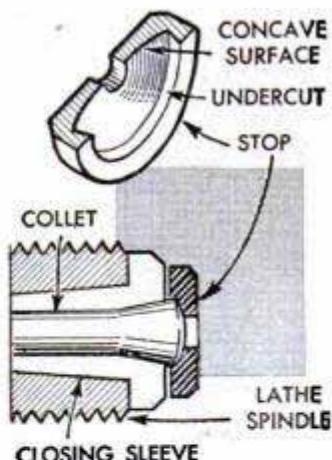
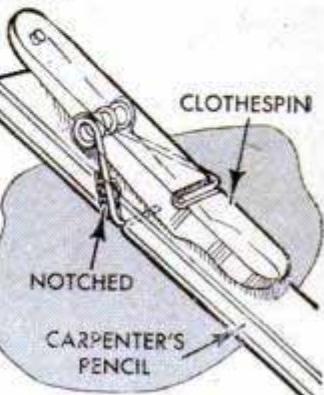
Clothespin Forms Pocket Clip On Carpenter's Pencil

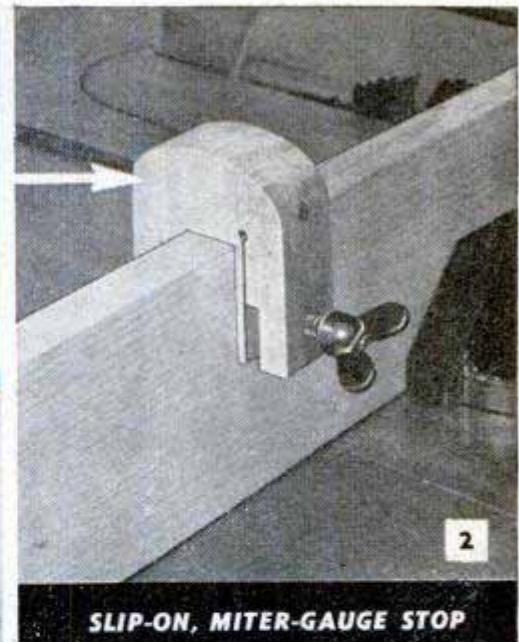
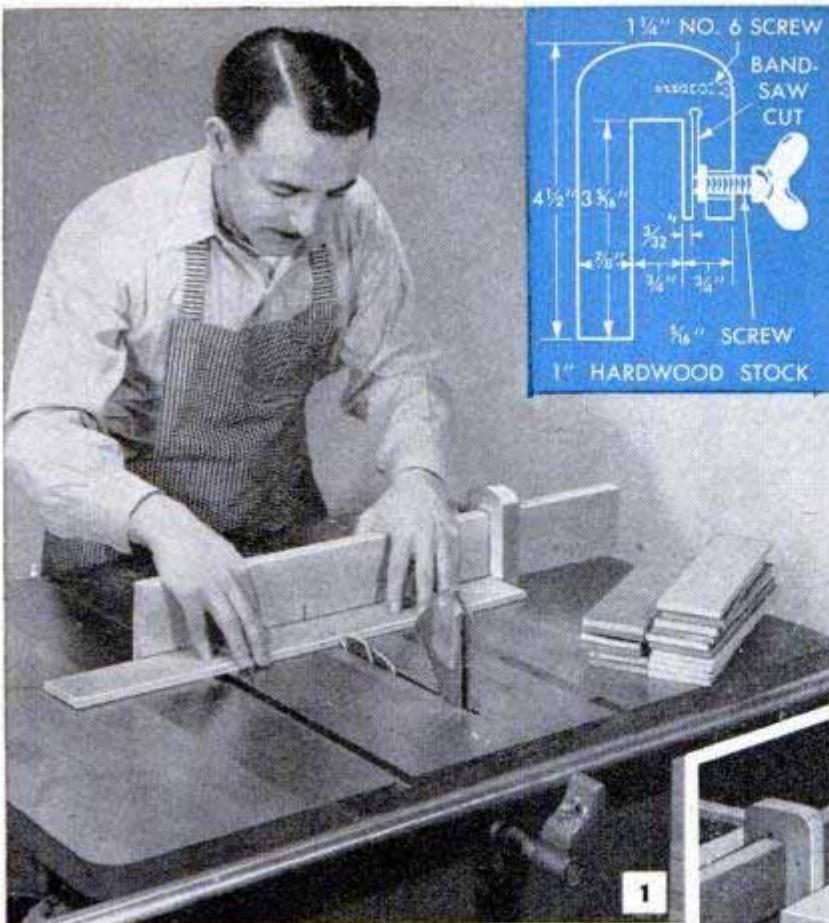
This handy pocket clip made from half of a spring-type clothespin keeps a carpenter's pencil from falling out of a shirt or overalls' pocket everytime the worker bends over. The side of the pencil is notched to receive one arm of the spring, and the clothespin is fitted to the other side of the pencil. The large plastic clothespins are excellent for this purpose.

Rae Prickett, Moffat, Colo.

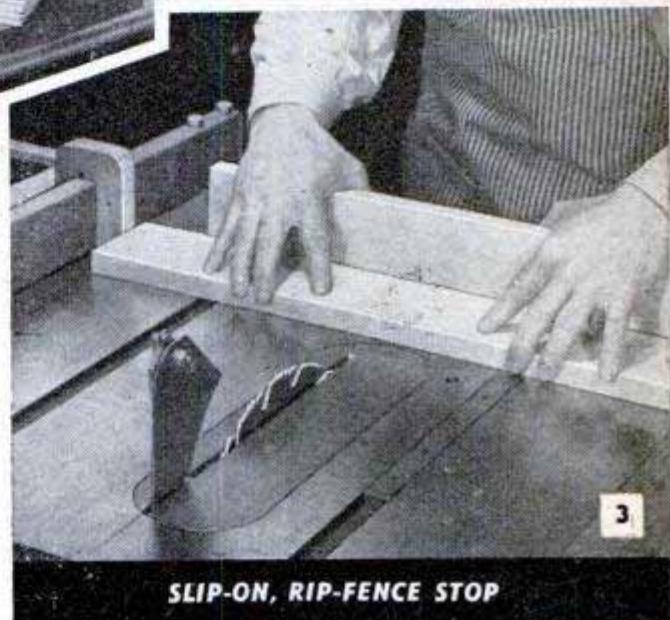
Collet Stop Aids in Producing Accurate Repetitive Work

Faced with the problem of holding uniformly close tolerances on work done in a second-operation lathe setup, one machinist devised this novel stop for use with a draw-in collet chuck. It will prove useful in any repetitive work where dimensions must be accurately held from a shoulder. The detail and also the sectional view of the stop in place on the collet are more or less self-explanatory. Of course, the stop must be made from mild steel to fit the collet being used, hence no dimensions are given. The diameter of the undercut recess in the back of the stop is such that the stop will slip over the end of the collet when it is drawn in. Then, when the collet is released to the normal open position, the stop will be held in place.—Geo. Austin, Syracuse, N. Y.





SLIP-ON, MITER-GAUGE STOP



SLIP-ON, RIP-FENCE STOP

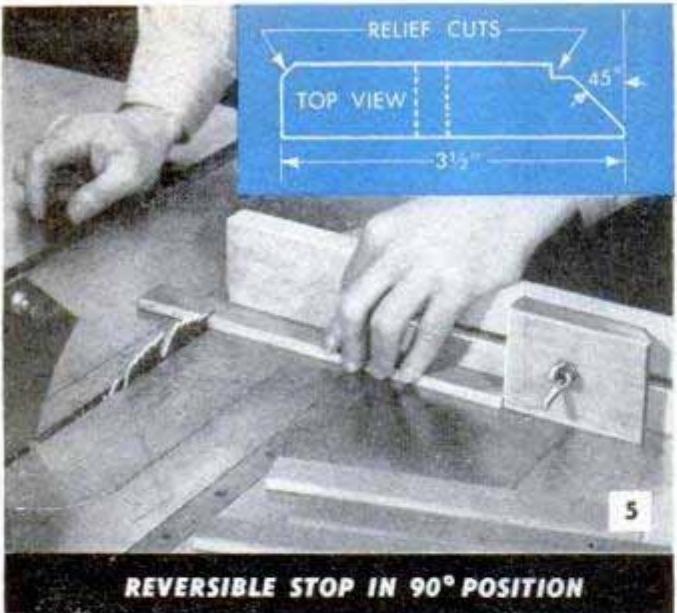


**REVERSIBLE SLIDING
STOP FOR MITER GAUGE**

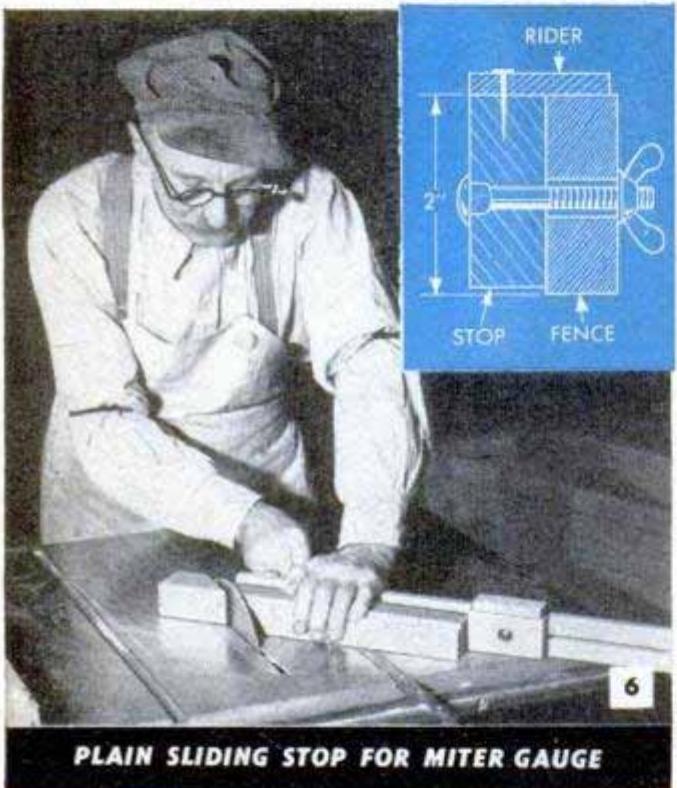
QUICK-SET STOPS for your bench saw

HERE ARE several easily made adjustable stops that can save a lot of time when you're doing duplicate cutoff work on a bench saw. As an example, take the miter-gauge stop which is used on a wooden facing attached to the miter gauge as in Figs. 1 and 2. Set it for the first cut with a rule and you can run any number of pieces all exactly the same length without having to bother with blocks and clamps. The construction is shown in the detail. The wing screw is turned through a nut and bears against a thin section of wood to hold the stop in place. A wood screw at the top guards against splitting. The clamping arm, Fig. 2, should be short enough to work over the top of the miter gauge. A companion piece is the slip-on, ripping-fence stop in Fig. 3. This unit does not require clamping. Merely cut it to a light, wedge-fit over the fence. The side toward the saw should be exactly 1 in. wide so that the scale on the ripping-fence guide bar can be used. The reading will be minus the 1-in. thickness of the stop, of course. Some operators prefer a built-in sliding stop, Figs. 4 and 5.

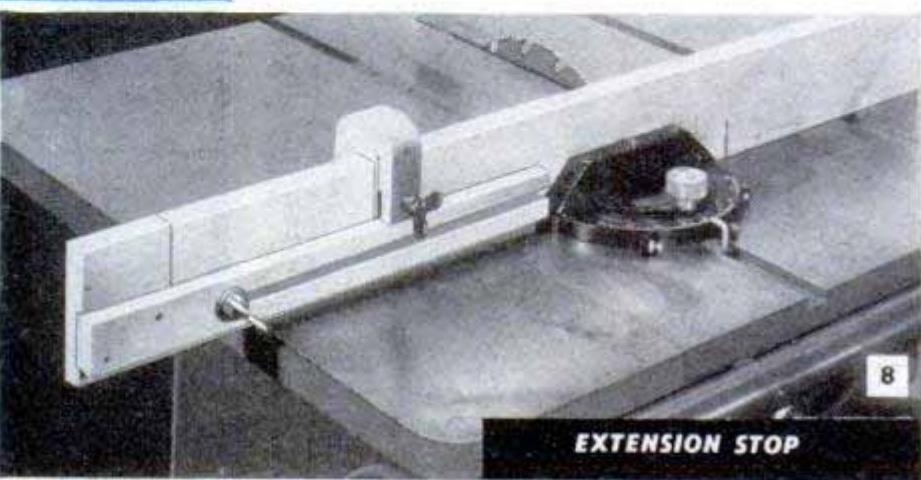
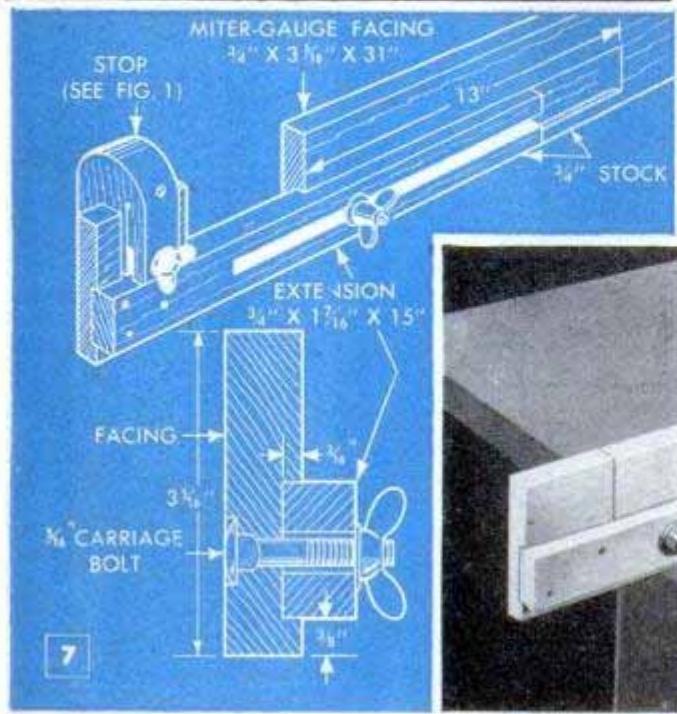
The unit in Fig. 4 consists of a wooden miter-gauge facing slotted and grooved to permit movement of a sliding stop. The head of the bolt holding the stop should be



REVERSIBLE STOP IN 90° POSITION



PLAIN SLIDING STOP FOR MITER GAUGE



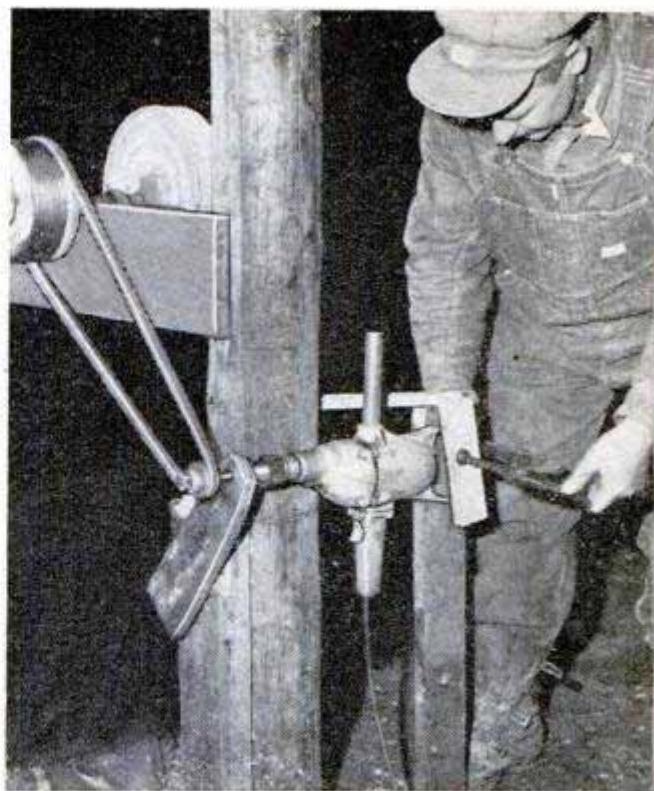
recessed deep enough to slide behind the miter gauge without binding. One end of the stop is cut square and the other at a 45-deg. angle. Either end can be used by simply reversing the block. The plain sliding stop, Fig. 6, is preferred by some operators, although it will not work behind the miter gauge. The projecting end of the facing strip is slotted through to permit the stop bolt to slide as in the detail, Fig. 6. Note that the miter-gauge facing is cut off flush with the saw blade. This is done to permit maximum travel of the stop block to the left for handling longer than average work. The extension stop, Figs. 7 and 8, incorporates all the features needed for cutoff work. The extension feature permits the handling of long pieces without sacrificing support on either side of the blade and, at the same time, the unit is sufficiently small to be handled on the average saw table without being unwieldy. The slip-on stop is the same as that detailed in Fig. 1. Fig. 7 details the construction and shows the shallow stopped groove run in on the back side of the facing to take the slotted extension arm. When the extension arm is not required, it fits neatly in the groove at the outer end of the facing as in Fig. 8. When making this stop unit, be sure to rip the facing wide enough so that the stop block will clear the top of the miter gauge. Clearance of the block is necessary when handling work of varying lengths as settings can be made anywhere from the blade to the end of the facing strip, or to the end of the extension piece.

Note in Fig. 5 that all the stop blocks described are relieved on the inside corners. This is necessary to provide clearance for splintered or burred ends on the work. When making duplicate cuts with a stop, be sure that sawdust does not accumulate in front of the facing strip, as this may be the cause of inaccurate settings. The end of the stop bearing on the surface of the saw table should be beveled about 5 deg. to give adequate clearance. Use hardwood for both the facing strips and the stops.

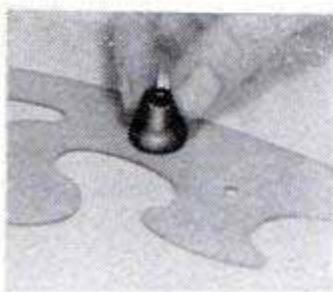
Portable Drill Used as Power Drive

Lacking an idle motor and jackshaft to drive his grindstone at the correct speed, one farmer used a portable electric drill as the slow-speed power source. He mounted the grindstone fixture on a bracket attached to a convenient post in the farm workshop. Then he mounted a small V-pulley on a $\frac{1}{2}$ -in. bolt and ground the threads off the end of the bolt to give the drill chuck a good grip. In the setup pictured, the bolt is passed through a $\frac{1}{2}$ -in. hole drilled through a short piece of hardwood which is nailed to one side of the post to serve as a bearing. The drill chuck is then tightened on the bolt and the drill is supported in a horizontal position by clamping the D-handle to an L-shaped wooden bracket. A V-belt transmits power.

A. M. Wettach, Mt. Pleasant, Iowa.



Drafting Instruments Lifted Quickly With Aid of Suction Cups

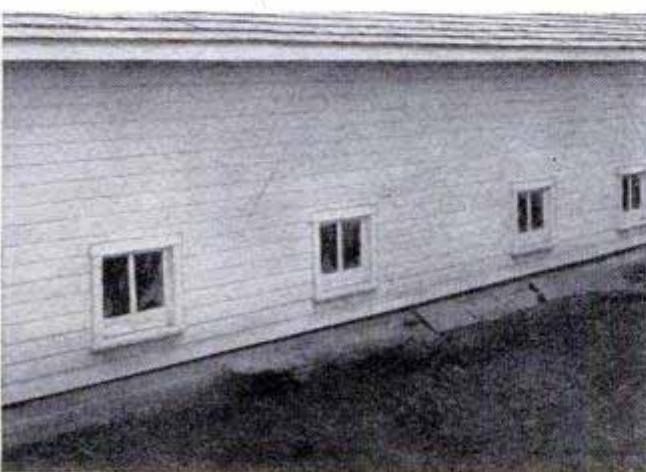


Instrument can be lifted directly upward, thus eliminating the danger of smearing the ink.

Richard Hanscom, Elmhurst, Ill.

Low Windows in Poultry House Supply Light Under Roosts

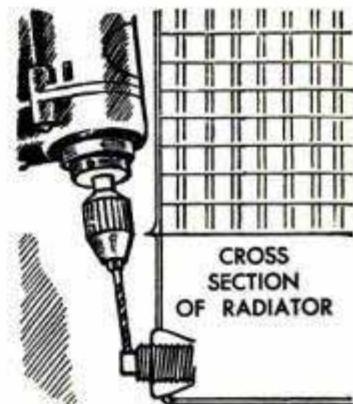
Installing ordinary two-light basement windows in the rear wall of a poultry house will allow light to enter the back of the house and under the roosts. Not only is this convenient when working in the poultry house, but the hens will face the windows, scratching the litter more evenly over the floor instead of only toward the back wall.



Removing Rusted Drain Plugs From Car Radiators

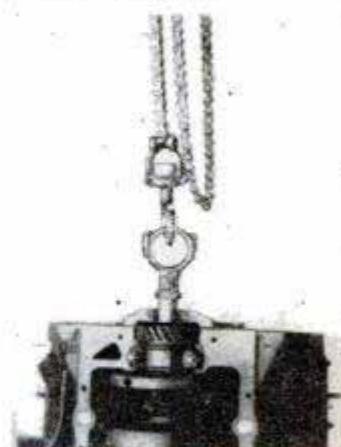
When frozen by rust, radiator drain plugs of the type used on some cars are practically impossible to remove. One mechanic solved the problem by drilling a $\frac{1}{4}$ -in. hole through the square shank of the plug. Then, he simply inserted a $\frac{1}{4}$ -in. pin punch in the hole and turned out the plug with comparative ease.

W. H. McClay, Pasadena, Calif.



Hoisting Ring for Car Motor

To eliminate the use of chains when lifting a car motor from the frame, one garage mechanic made a simple hoisting ring which screws onto the threaded end of the crank-shaft, replacing the fan pulley. The hoisting ring is made by sawing off the large end of a connecting rod and welding a nut in the end of the rod. The nut, of course, must be threaded to fit the crankshaft.



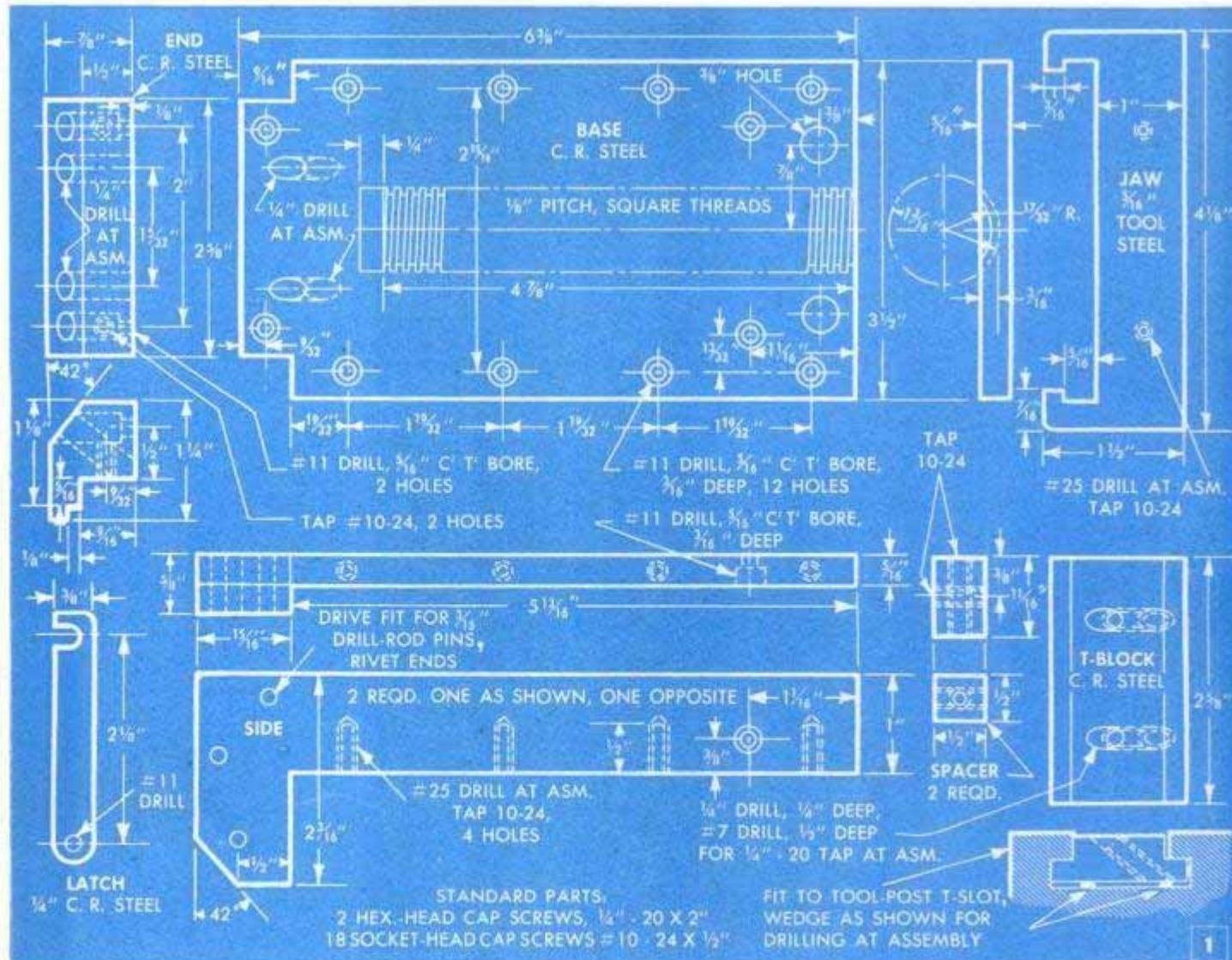
LATHE MILLING FIXTURE has compound-angle setting

By Everett W. Holt

TWO FEATURES of this milling fixture recommend it to machinists and manual-training departments doing specialized work and also to modelmakers with widely diversified problems in machining small parts. The fixture can be made completely on the lathe on which it is to be used and it has a provision for compound-angle settings, a particularly valuable feature where the shop lathe must be made to serve as a milling machine. The only additional lathe accessories necessary in the construction of the fixture are a stub arbor on which to mount a slitting saw, an end mill and a pair of small angle plates. Dimensions in the detailed drawings have been worked out to fit a lathe of 9-in. swing but, of course, these can be altered to make a fixture suitable for use on larger lathes.

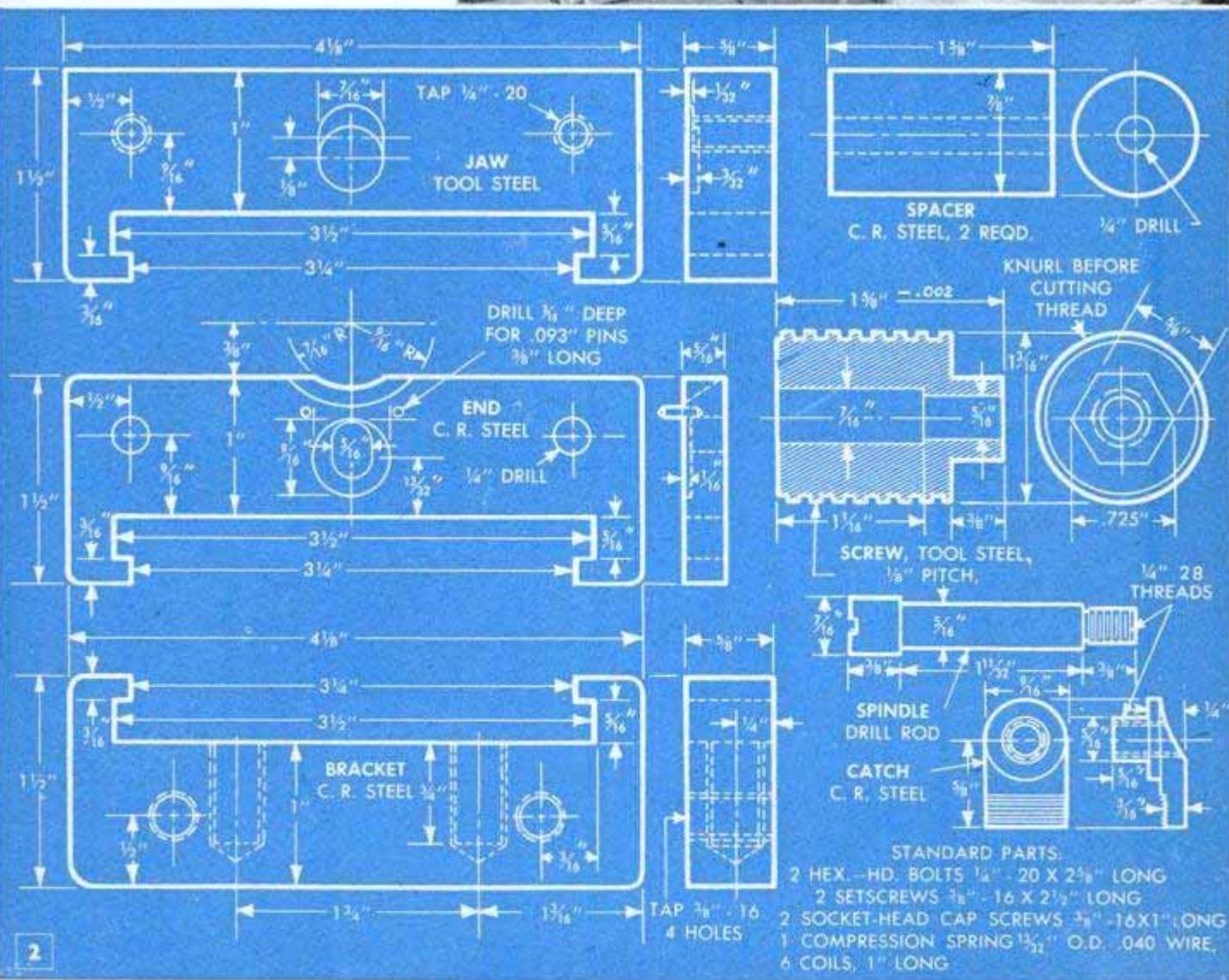
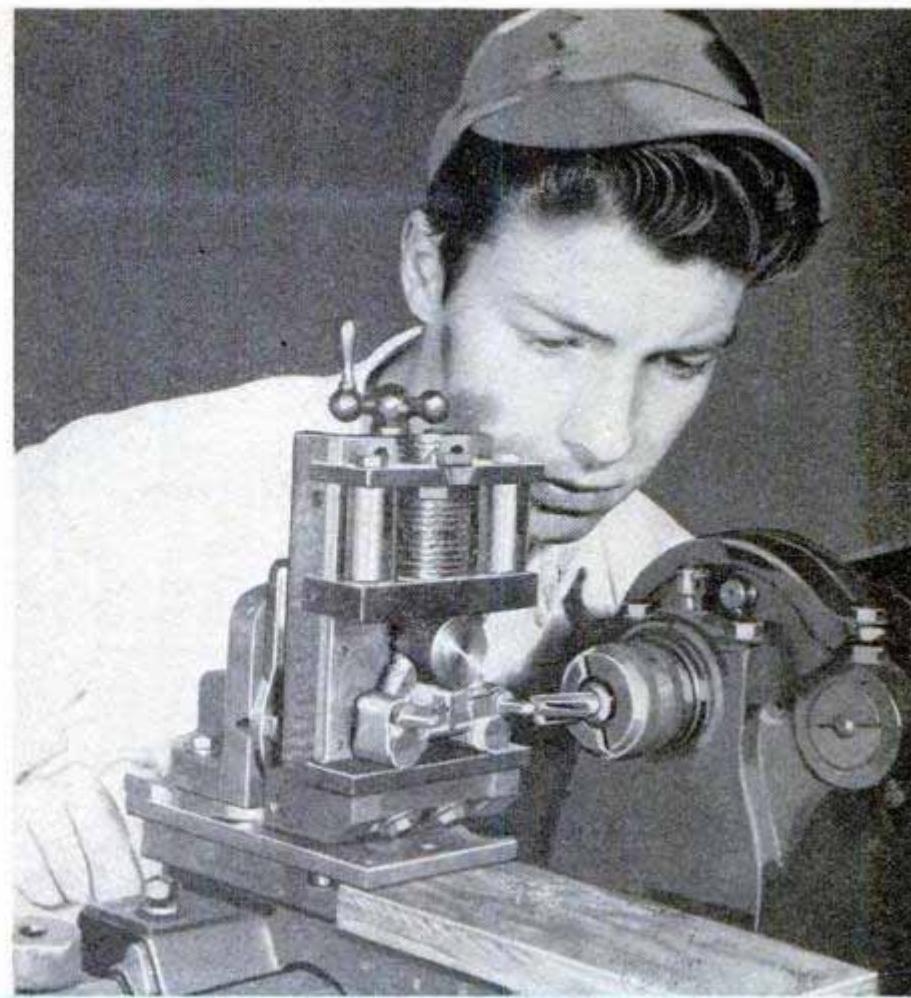
As detailed in Figs. 1 and 2, the fixture is

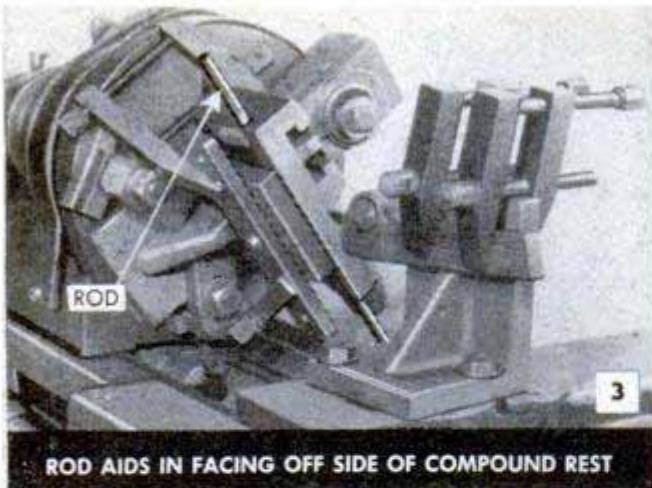
designed to straddle the compound rest. The sliding jaw has a quick-release device which permits adjustment to any position up to a 3-in. opening. The first step is to face off the sides of the compound parallel with the dovetail groove on the underside. The compound is removed from the lathe and, with a rod placed in the dovetail groove, the compound is clamped to a faceplate, Fig. 3. Accurate locating of the compound on the faceplate is accomplished by setting each end of the rod to the cutting bit. This assures perfect parallelism. As the milling vise locates from the end of the compound, machining the sides of the compound in this way is optional. However, this operation provides additional bearing surfaces to carry the load when making heavy cuts. Also, the end of the compound must check parallel to the faceplate when the



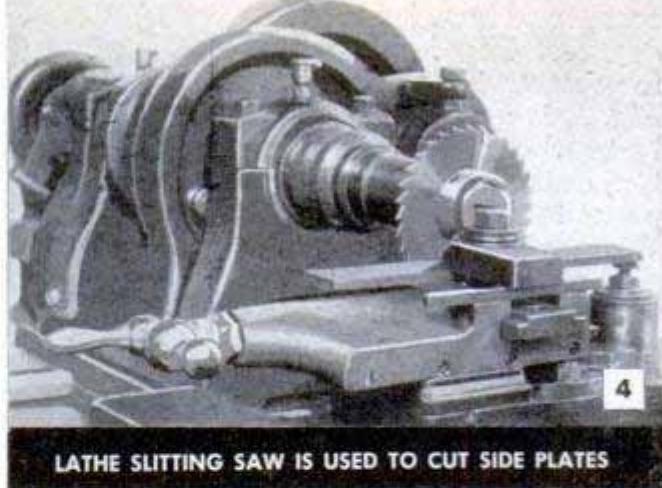
compound base is set at 90 degrees. The lathe setup for cutting the side plates, Fig. 1, is shown in Fig. 4. Note the support under the outboard end of the plate to prevent chatter. When running this support up to the surface of the plate, be careful not to spring the end upward. The endpiece, which supports the fixed jaw, is faced to size in a four-jaw chuck and is then clamped to an angle plate mounted on the cross slide for milling the bottom profile with an end mill. Drilling and counterboring for the jaw screws is done in this same setup before milling the 42-deg. bevel, Fig. 1.

For convenience in checking fit, the adjusting screw for the sliding jaw should be finished and threaded before cutting the threads in the vise base





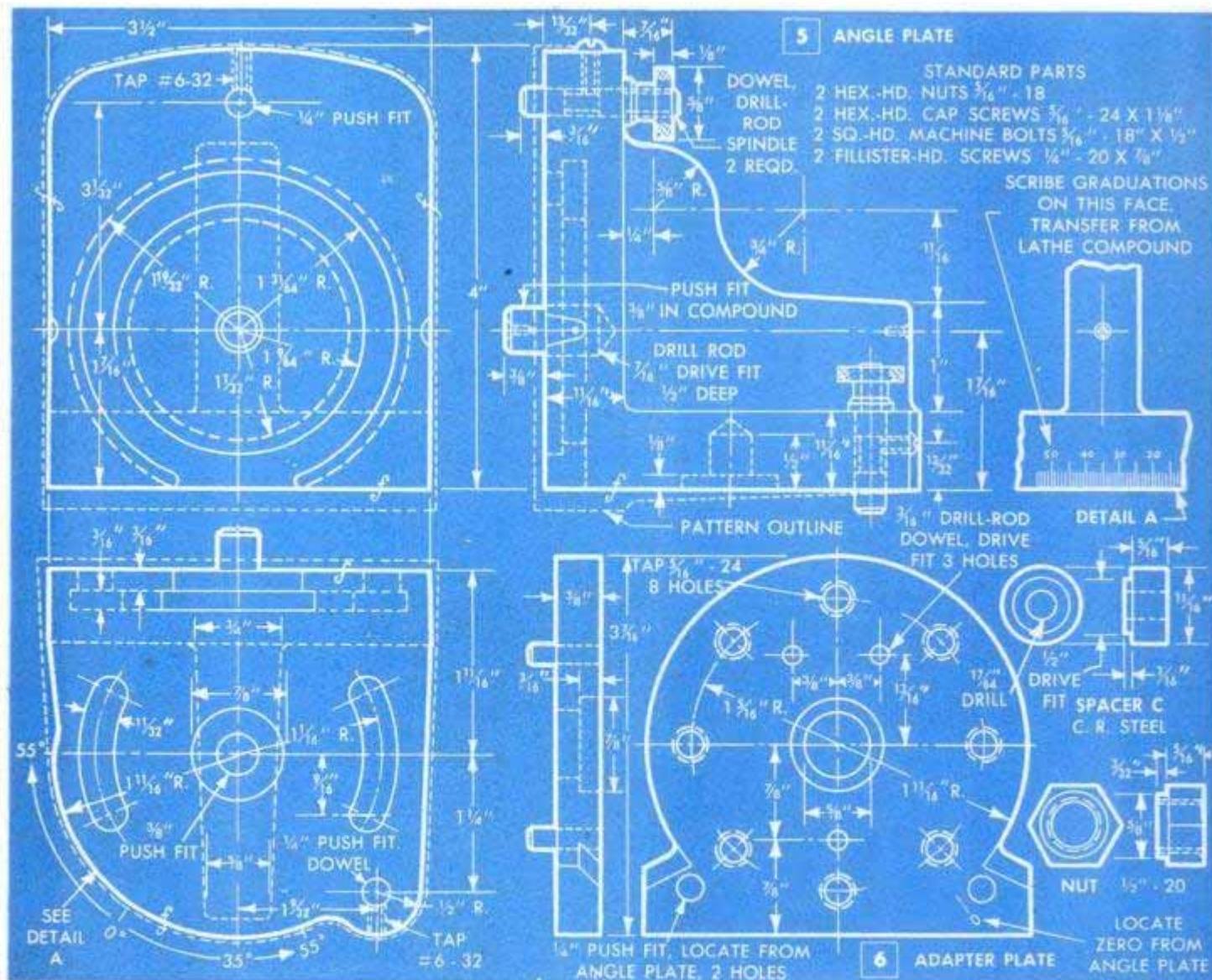
ROD AIDS IN FACING OFF SIDE OF COMPOUND REST

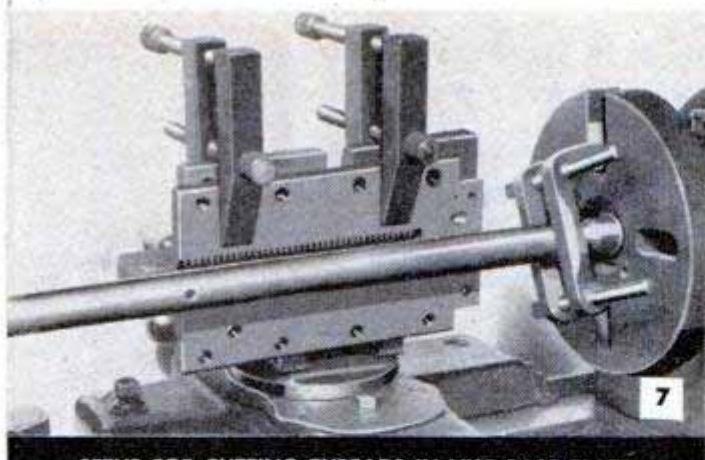


LATHE SLITTING SAW IS USED TO CUT SIDE PLATES

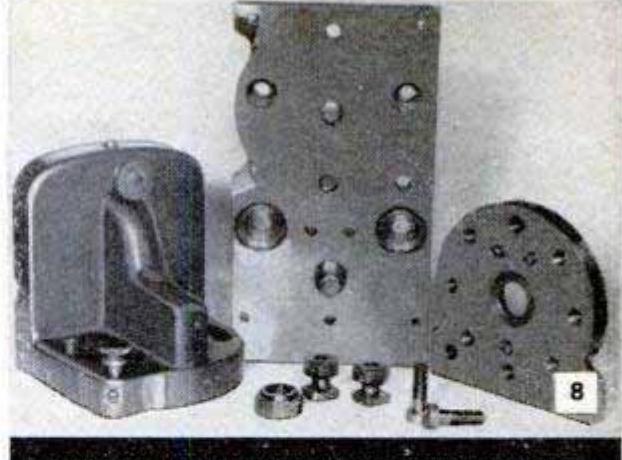
plate. Note that the screw is knurled before threading, Fig. 2. The setup for threading the base plate is shown in Fig. 7. The threading tool operates in much the same manner as a boring bar with a fly cutter. The bar is $\frac{7}{8}$ in. in dia. and 16 in. long and the threading tool is mounted in a hole drilled transversely through the bar about midway of the length. The tool is adjusted by means of a setscrew. After the half thread has been cut in the plate, check the fit of the screw through the full length of

the thread. Now, finish the balance of the parts detailed in Fig. 2. The parts of the sliding jaw, left-hand details in Fig. 2, are slotted and undercut by mounting the pieces in the four-jaw chuck. After turning, the arcs in the undercuts are filed flat. When all parts have been made and holes drilled and tapped where indicated, note carefully the upper left-hand and center left-hand details in Fig. 2. Dotted lines in the end view show the depths of the $\frac{7}{16}$ -in. offset recess in the jaw, while the end and





SETUP FOR CUTTING THREADS IN VISE BASE PLATE

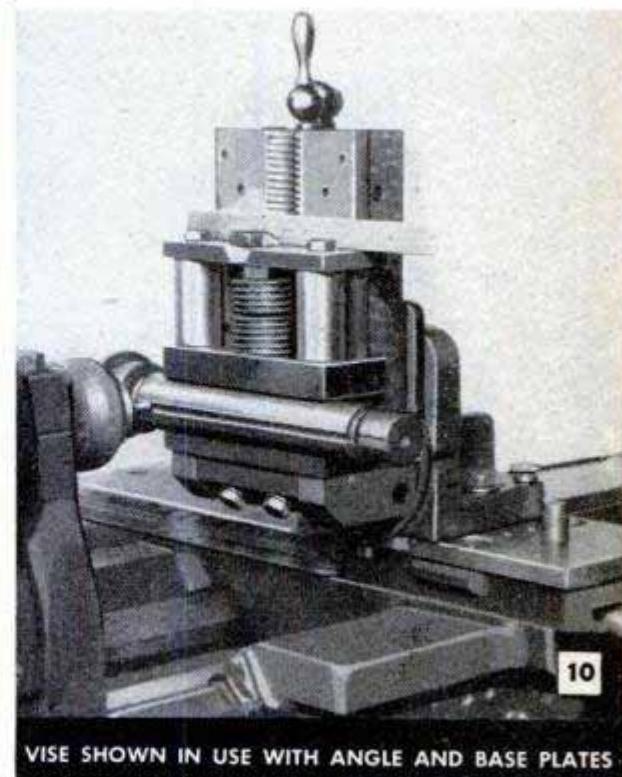
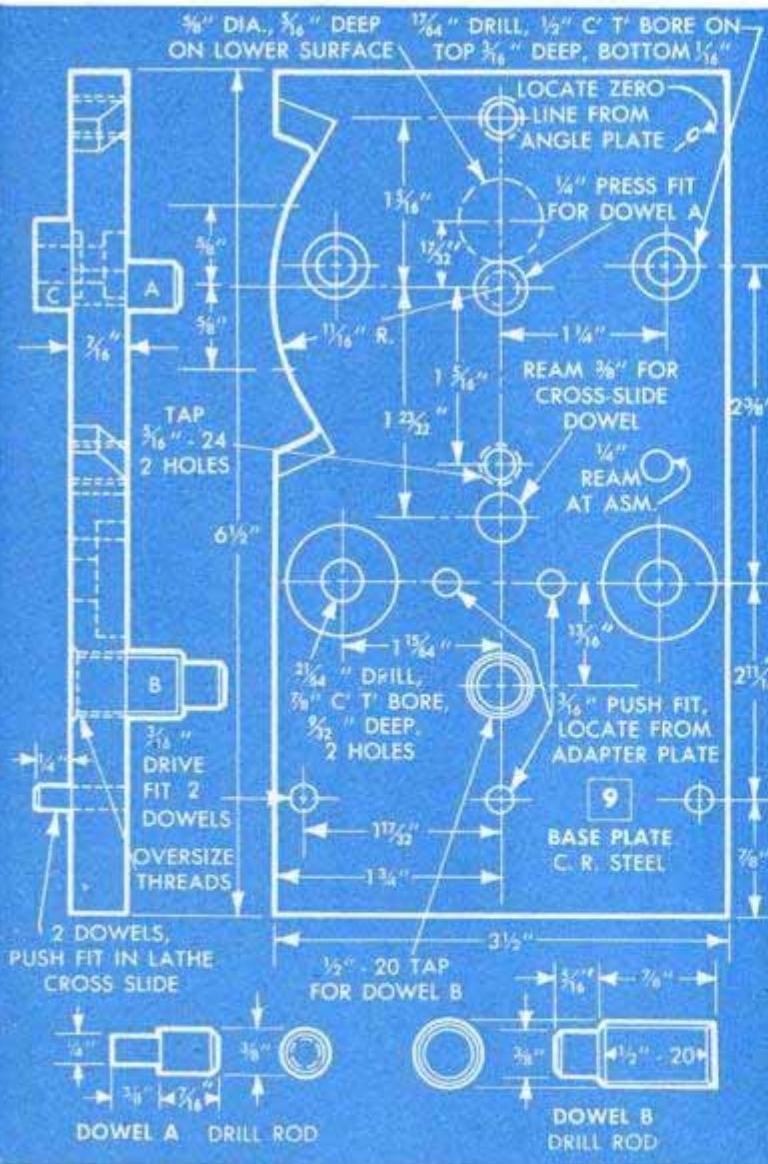


FINISHED ANGLE, BASE AND ADAPTER PLATES

flat views of the endpiece show the finger-slot radii and the $\frac{1}{16}$ -in. depth of the $\frac{9}{16}$ -in. recess. After drilling, the $\frac{7}{16}$ -in. hole in the endpiece is elongated to a slot, one edge of which touches the edge of the recess. In assembly, a spring fits over the body of the spindle to hold the head of the spindle in the deeper recess in the jaw. The catch, Fig. 2, seats in the recess in the endpiece and in this position holds the adjusting screw in positive engagement with the half threads in the base plate. When the catch is lifted

out of the recess, the movement allows the head of the spindle to slip out of the deeper recess in the jaw. This disengages the screw from the half threads in the base plate, leaving the jaw free to slide up or down. The position of this catch is shown clearly in Figs. 10 and 11.

The next parts to be made are the angle plate, Fig. 5, and the special base plate, Fig. 9. The purpose of the latter part is to extend the rearward travel of the vise beyond the normal cross-feed limits of the compound. If the travel of the compound is sufficient to serve your purpose, the base plate can be omitted and the angle plate, Fig. 5, can be made to fit the compound seat on the lathe carriage. With the base plate, the travel of the vise is sufficient for a 6-in. cut, Fig. 10. Note in Fig. 5 that the angle plate is shown in three views and the adapter plate, Fig. 6, in two views. The finished parts are shown in Fig. 8 along with the special base



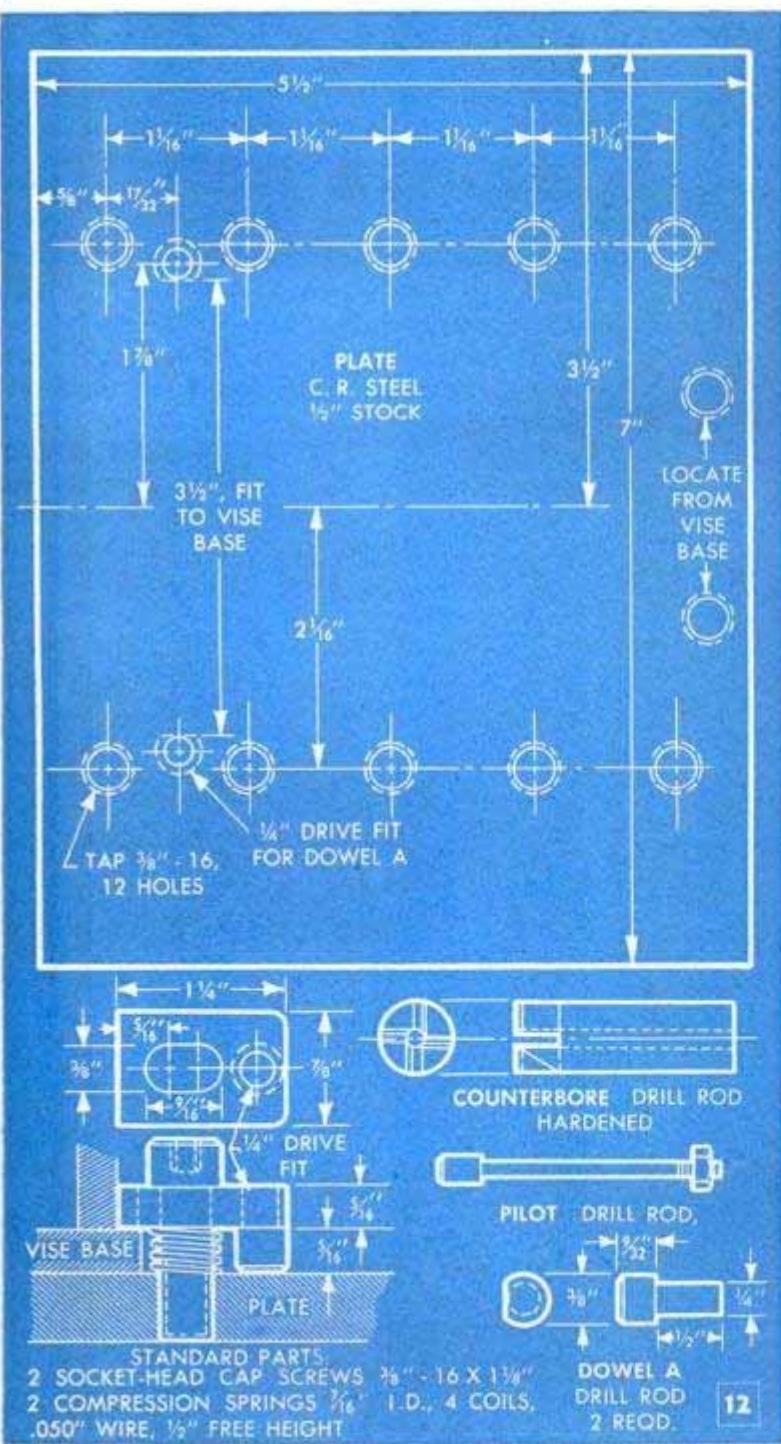
VISE SHOWN IN USE WITH ANGLE AND BASE PLATES



VISE POSITIONED FOR COMPOUND-ANGLE SETUP

plate. The angle plate and the adapter plate, Figs. 5 and 6, are castings made from special patterns, the pattern outlines being shown by dotted lines outside of the profile in the three views of the angle plate. Make the angle-plate pattern from three pieces of white pine joined with screws countersunk below the surface. Fill the screw holes and fillet all angles and corners with wood putty or beeswax. Sand the pattern smooth and finish with two coats of shellac. Be sure to make the proper shrinkage and draft allowances for gray iron on patterns for both the angle and adapter plates. Note especially in Fig. 5 that the rib, or web, of the angle plate is made high enough to provide a center for turning the circular T-slot in the vertical face. The curved slots in the base of the angle plate are made by drilling the end holes full size, then connecting with a series of smaller holes drilled along each arc. The waste is removed with a chisel and the arcs are filed flat to the scribed radius lines. All faces of the angle plate marked with the symbol "f" are finished either by filing or grinding to dimension. The graduations on the base of the angle plate are scribed from the compound with the two parts clamped together. The push-fit dowel in the base of the angle plate locates the work square with the cutter in two positions and the dowel in the vertical face, or leg, locates the vise jaws parallel to the cross slide by engaging a hole drilled in the bottom of the compound.

The plate detailed in Fig. 12 is used to support work not adapted for gripping in the vise. The plate attaches at the top with the screws used with the detachable end bracket and is fastened at the bottom with the special clamp detailed at the lower left in Fig. 12. It pays to make the small, piloted counterbores which must be used on certain parts of the vise. Examples are the counterbores for dowels A and B in Fig. 9 and dowel A in Fig. 12. The counterbores are of the interchangeable pilot type and can be made from drill rod as in the lower right-hand details in Fig. 12. Drill the body of the counterbore longitudinally for the pilot, then saw two slots at right angles across one end. File away the waste at an angle between the slots to form cutting edges. Then heat the counterbore to a cherry red and quench in water. Hone the cutting edges with a fine oilstone, heat the shank until the cutting end turns to a straw color and quench again.



Lightweight Wheelbarrow Has Aluminum Frame

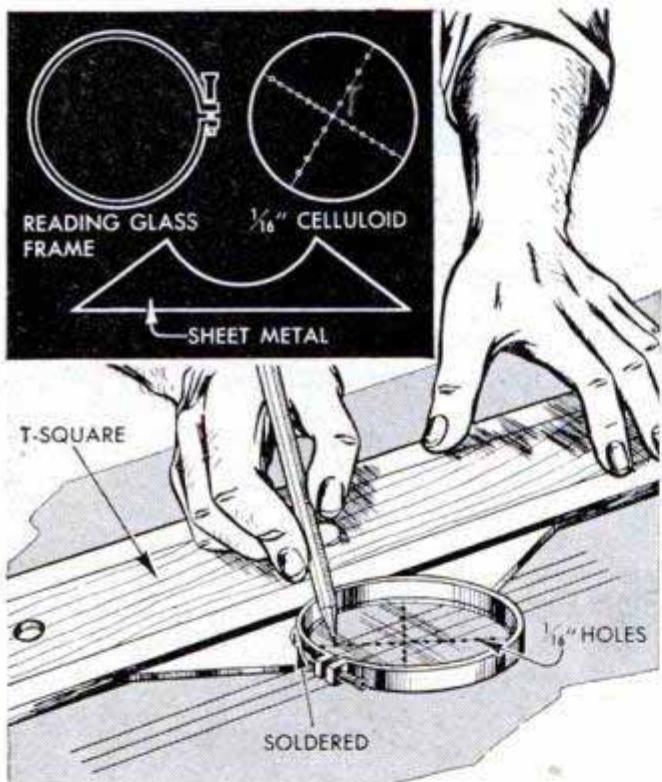
Utilizing his portable welding outfit, one farmer made a lightweight wheelbarrow from aluminum tubing. A strong, rigid frame of truss-type construction is formed by cross-bracing the tubing. A wooden platform is bolted to the upper longitudinal members and also to the front members of the wheel yoke, bolt holes being drilled through the tubing. Note from the photograph that each side of the wheel yoke is made up of three lengths of tubing joined at the axle bearing. Each leg consists of two lengths of tubing, additional rigidity being gained by welding the leg members to the length of tubing



which runs from the wheel to the outer end of the handle. The handles are fitted with rubber bicycle handgrips and the wheel is equipped with a pneumatic tire.

Kenneth R. Imig, Watseka, Ill.

Adjustable Line Guide for Draftsmen Made From Old Reading Glass



Here's an adjustable ruling guide that can be made inexpensively from a discarded reading glass, a piece of celluloid and a strip of sheet metal. The handle and lens are removed from the reading glass and the lens is replaced with a celluloid disk. Two rows of holes to take the point of a pencil are drilled in the disk at right angles to each other, the spacing of the holes in one row being different. For example, holes can be $\frac{1}{8}$ in. apart in one row and $\frac{1}{4}$ in. apart in the other. Before the celluloid is fitted in place, the rim of the reading glass is cut off and filed down to within $\frac{1}{32}$ in. of the lens groove to bring the disk nearly flush with the bottom. A sheet-metal straight-edge, cut to fit the diameter of the rim, is soldered to the latter. A bicycle-spoke socket is used as a setscrew to clamp the rim around the disk. In use, variation in the spacing of the lines is had by merely loosening the setscrew and rotating the celluloid disk slightly.

Julius Marsh, Riverside, Ill.

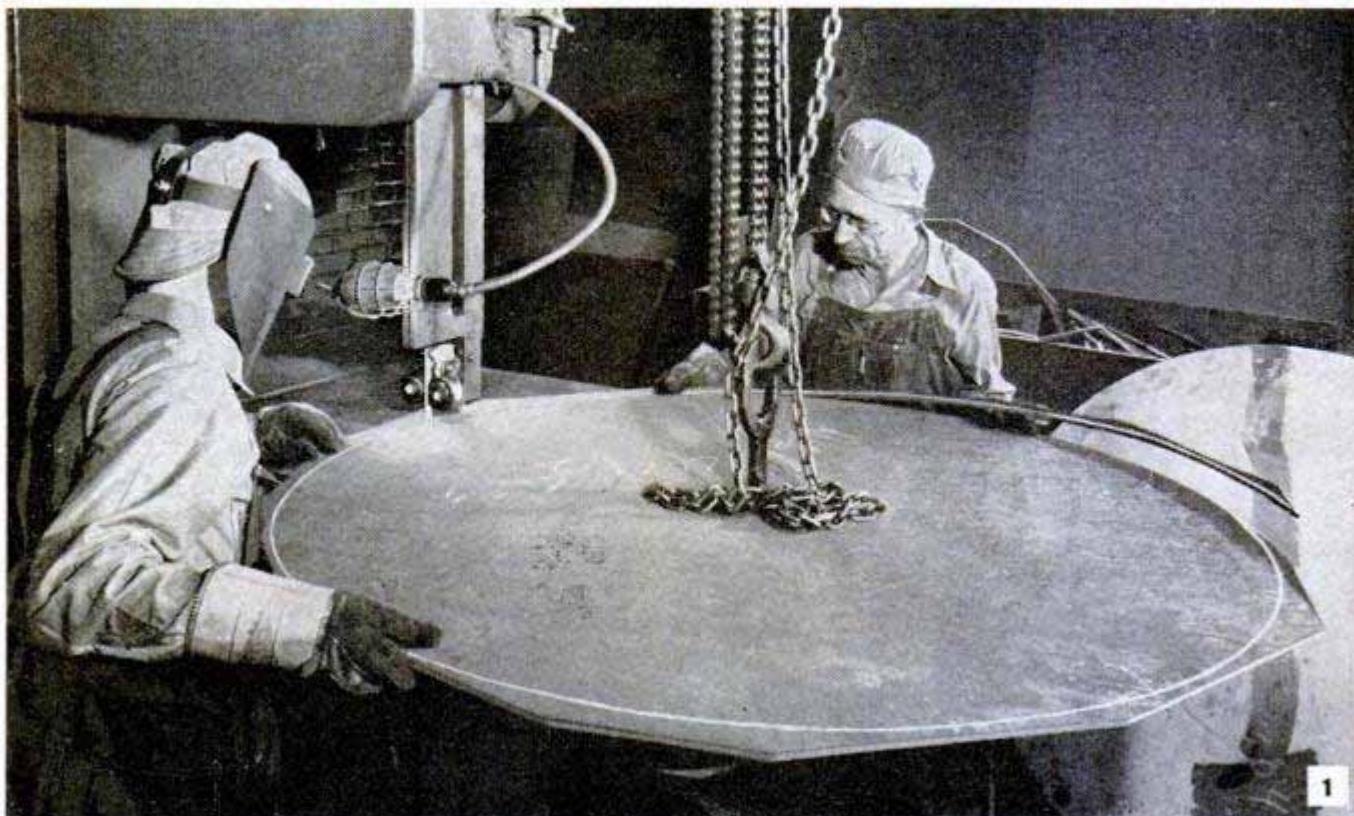
Poultry Roosts Hinged to Wall in Sections Facilitate Cleaning Dropping Pits

To shorten the job of cleaning his poultry houses, one poultryman made the roosts in hinged sections so they could be raised to give easy access to the dropping pits. The sections consist of frames made from 2 x 4s covered with 1 x 2-in.-mesh welded wire. The frames are hinged to the back wall of the dropping pits and hooks are provided in the ceiling joists to hold the sections in the raised position. Individual roosts are nailed across the top of the frames over the wire mesh.

A defective spark plug can result in wasting 10 percent of the gasoline burned.



FIXTURES FOR FASTER SAWING



1

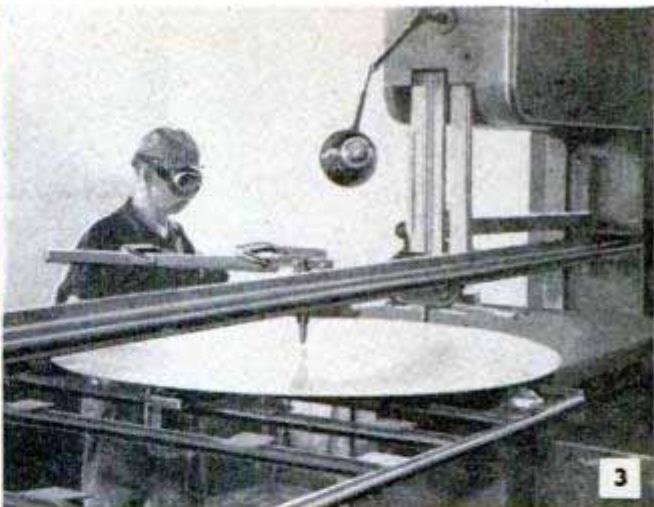
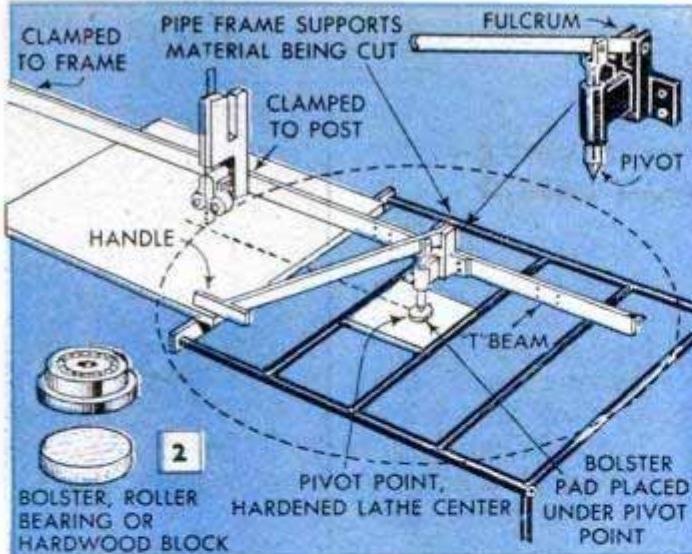
By Alexander Maxwell

PROBLEMS of cutting duplicate parts of sheet metal and other materials in small custom shops are easily solved by friction sawing. Simple jigs and fixtures can be made to handle special work even though there are only a few parts of any one kind or size. A good example of the type of work that comes into the custom shop is that pictured in Fig. 1. Here, a heavy disk nearly 4 ft. in diameter is being cut from a rough-trimmed blank of stainless steel by friction sawing. First the circle is laid out and marked on the blank and a hole is drilled through at the center for a heavy eyebolt. Then the work is supported at the side of the machine, in position for sawing, by means of a chain hoist. Where the work is of such a nature that the cutting must be done without relying entirely on the ability of the operator to follow a line under difficult conditions, use of the special circle-cutting jig detailed in Fig. 2 is advisable. To support a large disk, this jig must be of welded construction with all parts sufficiently heavy to prevent springing. The pivoting unit is supported on a T-beam bolted to the saw frame. Note that a series of holes is drilled in the legs of the beam so that the unit can be moved along the length of the beam as the radius of the work requires. Bolster pads are welded to the supporting frame directly under the pivot pin, and the work is supported on a small block of hardwood or a ball-thrust bearing, which

rests on the bolster. When the setup is complete and the work is in position, the pivot pin is lowered to the surface of the work by means of the handle. Light pressure on the handle will force the hardened point of the pin into the work sufficiently to hold it in position while the circular cut is made, Fig. 2. After the cut is started, the disk may tend to tip because of the greater weight of metal at the outer edge of the work. To avoid the necessity of having to hold down a heavy disk, some operators place a C-clamp on the supporting frame under the outer edge of the disk. The edge of the disk rides on the clamp which can be seen in position in Fig. 3.

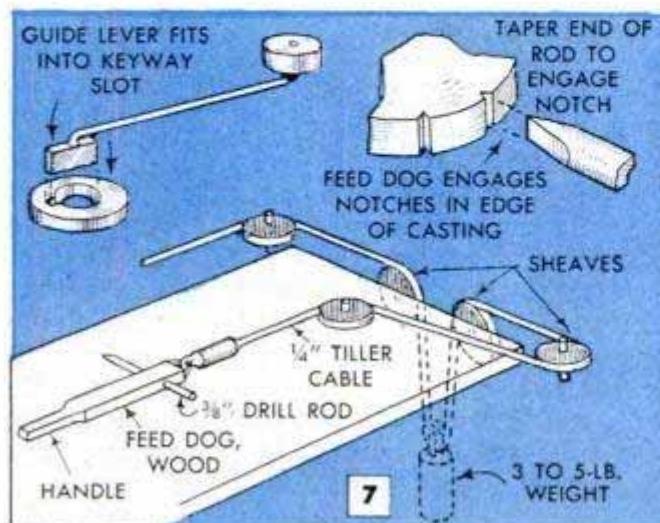
Building a jig for cutting segments of a circle is equally simple. Fig. 5 details a good one and Fig. 4 shows an example of the work. A T-shaped radius bar swinging from a pivot pin, Fig. 5, carries the work blank to the saw. Two locating pins on the radius bar are inserted in jig-drilled pilot holes in each blank to eliminate the possibility of slippage, or error in the radius of the curved cut. Make sure that the pivot pin, Figs. 2 and 5, is on a line with the saw blade. On a short radius, it is best to use a narrow blade to provide ample clearance between the back of the blade and the outside edge of the saw cut. If the blade binds even slightly, it will leave a rough edge on the work and also may be damaged by heating.

Where the radius of the work varies on the single piece, as on a cam, operators use the jig shown in Figs. 6 and 7. Here, the

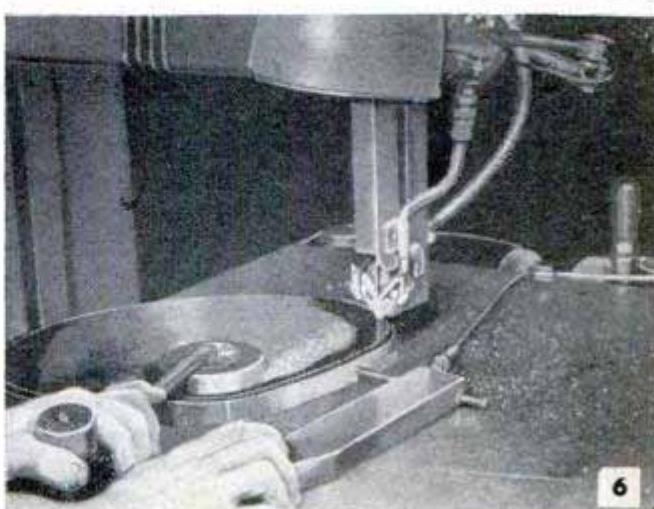
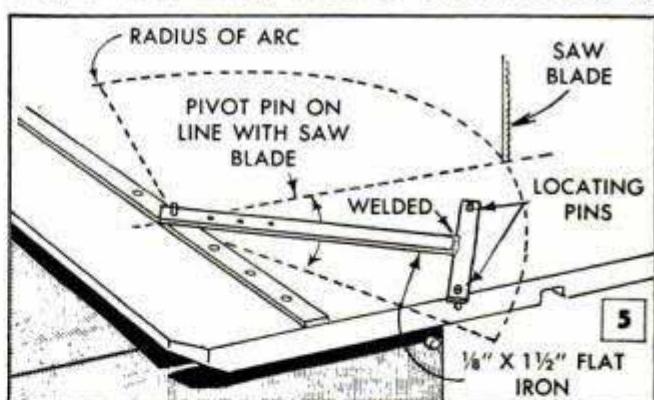


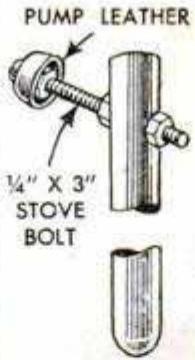
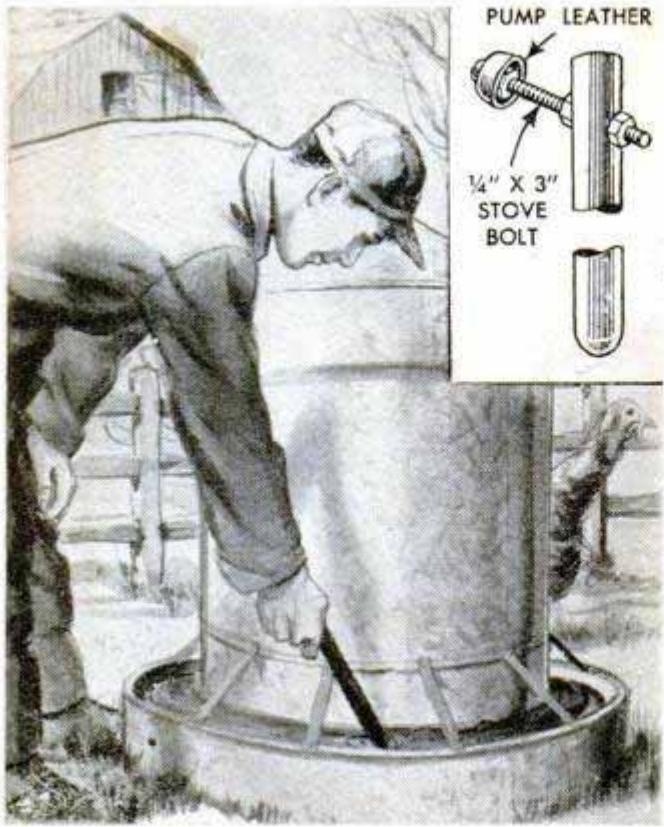
Perfect circles can be friction-sawed from heavy sheet metals with setup employing centering jig

work is guided by hand in sawing to the layout line and cutting pressure is maintained by means of a weight working against a hand-held feed dog, Fig. 7. This arrangement enables a skillful operator to produce extremely accurate work and at the same time relieves him of the tiresome job of maintaining cutting pressure by hand. The edges of the rough cam are V-notched at regular intervals and a guide lever is made up to suit the work as in Fig. 7. The crossbar on the end of the lever engages the keyway in the cam as in Fig. 6. This gives the operator control of the direction of cut. The feed dog, which is held in the right hand as in Fig. 6, engages the notches cut in the edge of the rough cam and the pull of the weight on the dog applies sufficient pressure to the work to keep the saw blade engaged. As the cut progresses, the operator shifts the dog from one notch to the next until the cut has been completed. On the job illustrated in Fig. 6 it will be necessary to stop the feed and the machine at one or two points along the length of the cut and shift the guide lever to avoid having it interfere with the progress of the cut. With this arrangement, it is possible to cut a variety of curved shapes from metal sheets and plates.



Above, special jig for cutting circle segments of varying radii. Below, detail of segment-cutting jig





Stopper in Poultry-Fount Outlet Fitted With Wooden Handle

When refilling large poultry fountains, one turkey rancher uses a novel stopper on a wooden handle to plug the fountain outlet. In this way, he does not have to plunge his hands into the icy water to stop the hole. A piece of broomstick, about 10 in. long, forms the handle and this is drilled at an angle near one end to take a 3-in. bolt. A pump leather or rubber stopper large enough to close the hole in the fountain is fastened at the head of the bolt. Then the bolt is passed through the handle and tightened in place with a nut on each side of the broomstick.—A. E. Holden, Angola, Ind.

Cross-Bracing Supports Gatepost

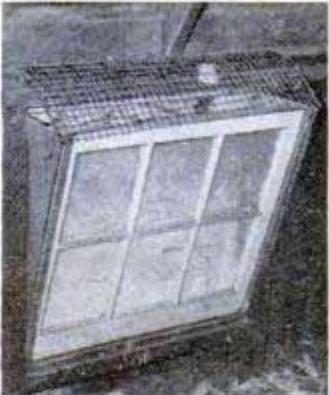


As most gateposts are braced in line with the gate to support the weight of the latter while it is closed, they have a tendency to sag when a heavy gate is swung open. This can be corrected by mounting a sturdy diagonal brace to each side of the hinge post as shown in the drawing. The braces should be located so the gate can be opened fully. However, when they are used, the gate cannot be swung back flush with the fence.

W. R. Black, Contact, Nev.

Chickens Prevented From Roosting On Poultry-House Windows

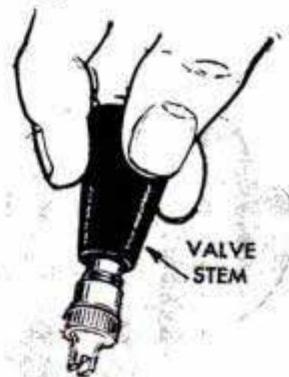
Chickens are kept from roosting on poultry-house windows of the ventilating type if strips of hardware cloth are used to form sloping screens over the tops of the windows. When covered with a screen in this way, the sash can be left open for ventilation. Bending the screens down at the ends prevents entrance of preying animals.



Rubber-Covered Valve Stem Provides Useful Garage Tool

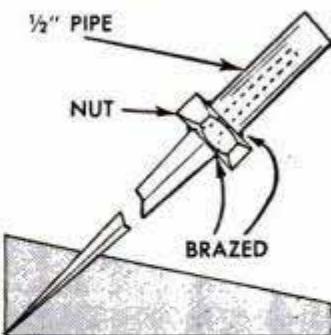
Cutting the valve from an old inner tube provides a handy tool for deflating tires and removing valve cores for replacement. Leave the rubber around the stem intact and screw a notched-type valve cap to the end. The rubber serves as a convenient handle and the tool is not as likely to get lost as a lone cap.

Lyle Brands, Falconer, N. Y.



Old File Forms Handy Extractor For Broken Bolts and Screws

By means of an extractor made from an old three-cornered file, bolts and screws can be removed easily even though their heads have been broken off. First, grind the blade of the file to sharpen the corners and tip. Then, slip a nut over the file tang and braze it to the top of the blade. A short length of $\frac{1}{2}$ -in. pipe is then brazed to the nut to form a handle. To use, drill a hole in the center of the part to be removed. Place the tip of the extractor blade in the hole and tap the handle so the corners of the blade grip the metal. Finally, clamp a wrench over the nut and turn the extractor to back-out the broken part.



R. E. Dow, Conway, Ark.

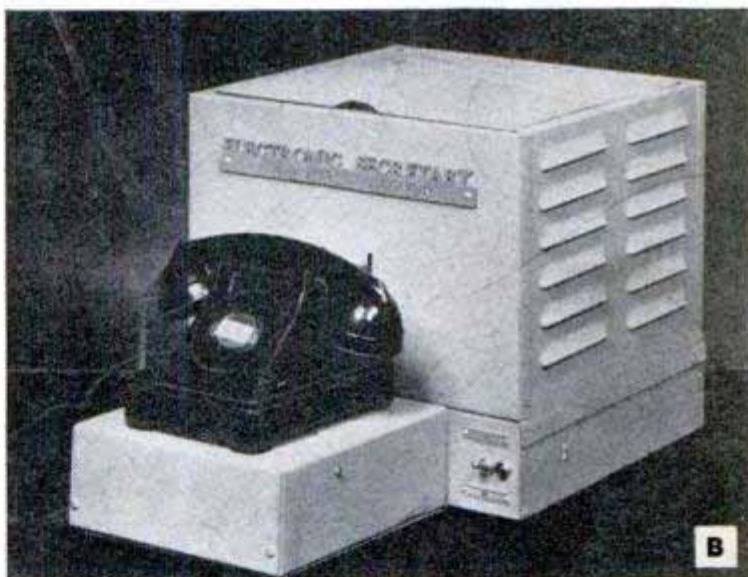
Electronic Secretary

MANY important telephone calls go unanswered in offices every day. This would not happen if you had an electronic secretary on the job. Briefly, this is what would take place if you called an office equipped with one of the Zimmerman electronic secretaries illustrated. A voice at the other end would answer something like this: "Yes, this is the Soapy Box Top Company. You are listening to a recorded message. Mr. Smith is out right now but if you wish to leave a message you have exactly 30 seconds to do so." Then you give your name, leave a message, telephone number or order, and hang up. When Mr. Smith returns to his desk he simply flips a switch, and this robot electronic secretary repeats the message.

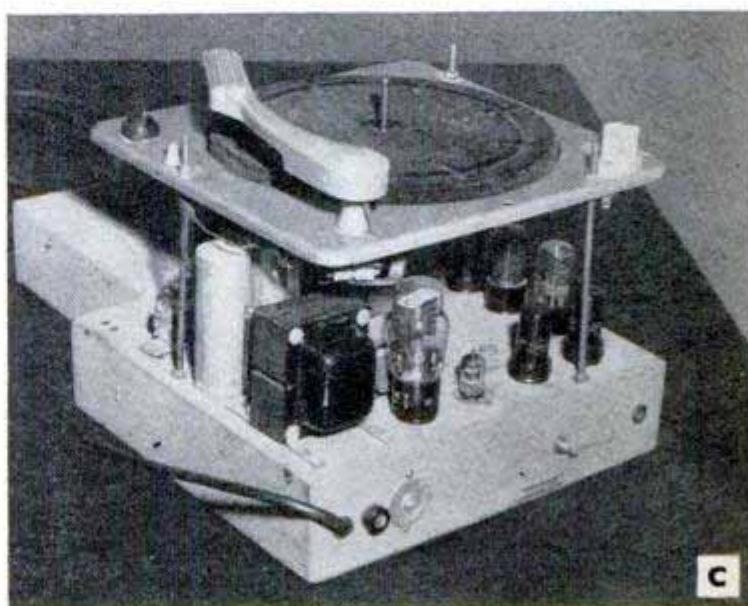
The inventor, Mr. Joseph Zimmerman, is shown with one of his early models in photo A. Photos B and C are external and interior views of the present compact unit now being manufactured. The device operates entirely without wired connections to any telephone equipment. It consists of a standard wire recorder and record player, a small desk box on which the telephone is placed, a weighted "lifting box" to put on the receiver hook in place of the receiver, and a series of sensitive relays and automatic switches. For operation, you merely take the receiver off the hook and replace it with the lifting box. This holds the receiver buttons down and, when the phone rings, the vibrations are picked up and amplified with vacuum tubes to a point where they operate a sensitive relay. This relay in turn operates others, the lifting box goes into action, starts the automatic turntable and gives the caller the prerecorded message. When the message runs out, the wire recorder takes over for the reply. At the end of 30 seconds, the "canned" message cuts in again with a warning: "Your time is up. If you need more, please call this number again. Thank you."



A



B



C

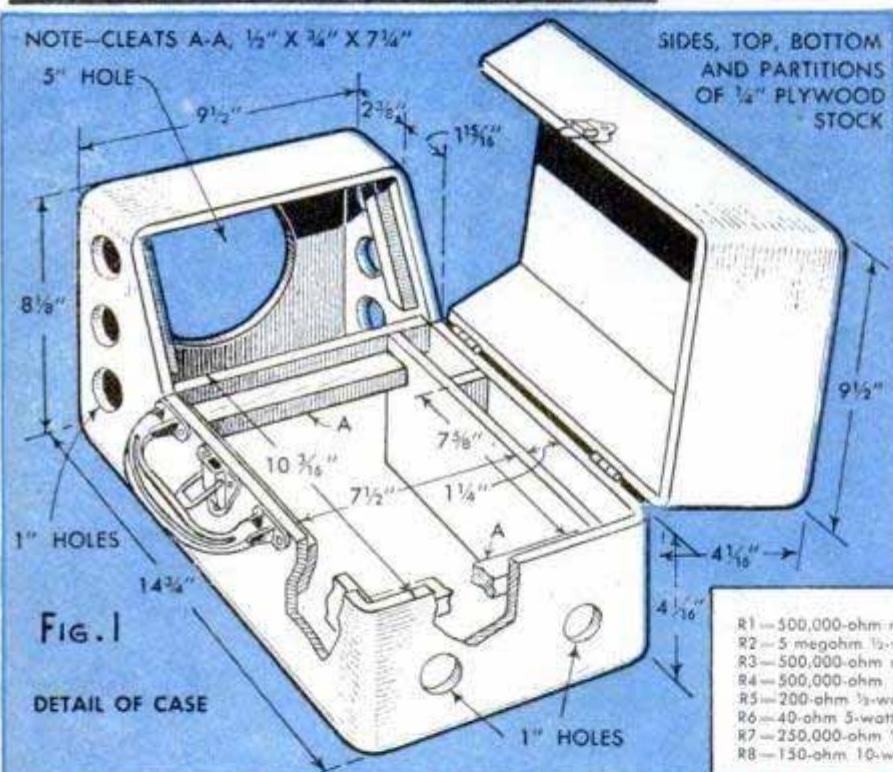
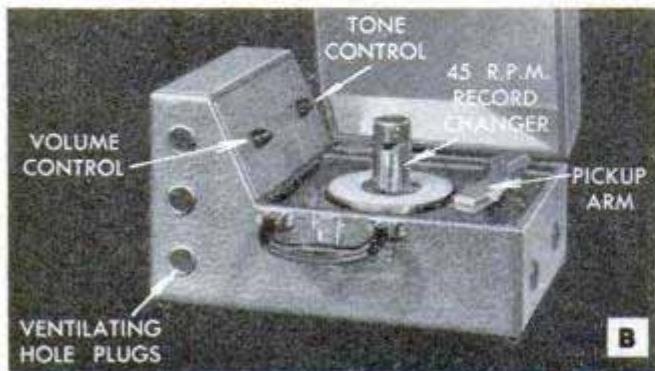
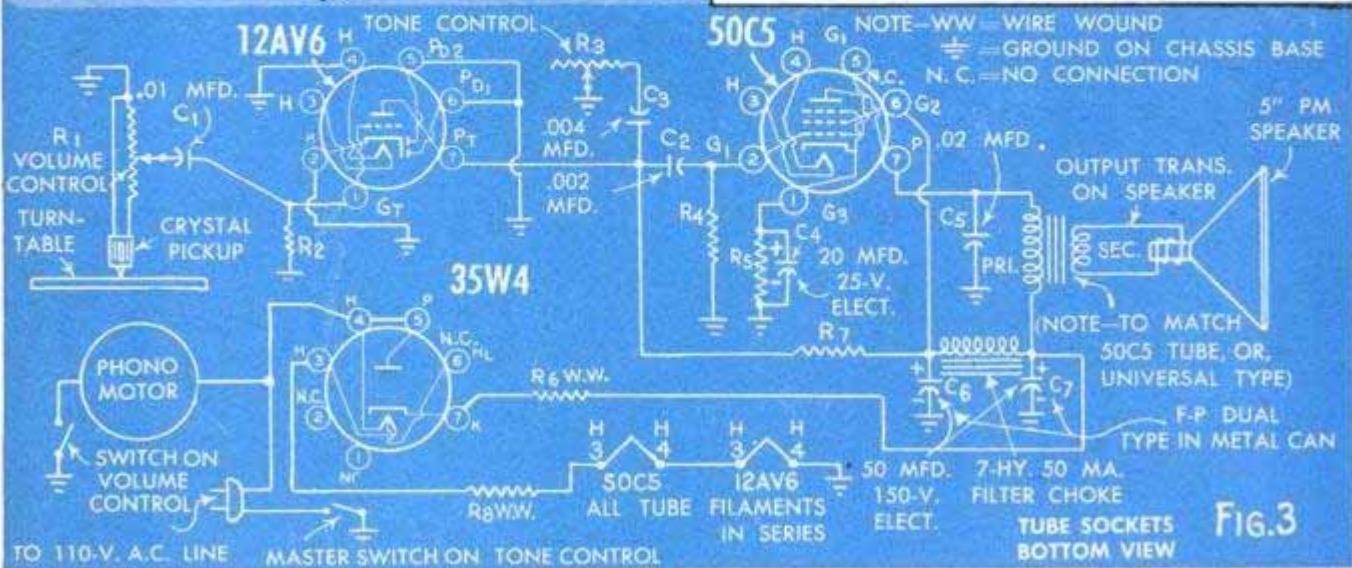


FIG. 1

DETAIL OF CASE



AMPLIFIER FOR 45 R.P.M. RECORD

By Joseph Vanella

PERHAPS the most interesting recent event in the field of recorded music was the introduction of the 45 R.P.M. record changer and the colorful RCA 7-in. plastic disks especially designed for it in seven shades according to music types. These small records play up to $5\frac{1}{3}$ minutes, which is equal to the longest playing time of the conventional 12-in. disk.

The unit plays from eight to ten records at one loading and provides 50 minutes of music without attention, or a full hour and 40 minutes with one turnover of the records. Students and experimenters can purchase the record-changer mechanism, developed by RCA and built by licensed manufacturers, from radio-parts houses for about \$15. The changer unit is easily connected to a portable amplifier or the audio stages of a receiver. The base plate of the Crescent Industries model C6-A1 as illustrated in this article is only $7\frac{1}{8} \times 10\frac{1}{8}$ in. The over-all height is

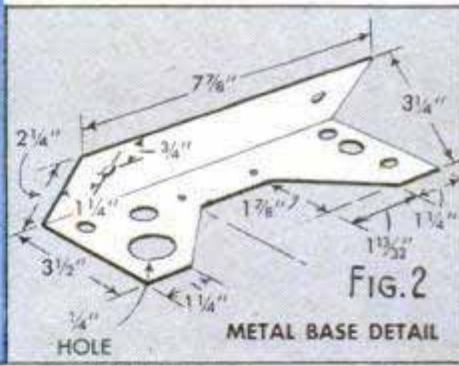


FIG. 2

METAL BASE DETAIL

RESISTORS

- R1 = 500,000-ohm midget volume control, audio taper, with s.p.s.t. switch
- R2 = 5 megohm $\frac{1}{2}$ -watt carbon
- R3 = 500,000-ohm midget tone control, audio taper, with s.p.s.t. switch
- R4 = 500,000-ohm $\frac{1}{2}$ -watt carbon
- R5 = 200-ohm $\frac{1}{2}$ -watt carbon
- R6 = 40-ohm 5-watt wire-wound, or carbon
- R7 = 250-ohm $\frac{1}{2}$ -watt carbon
- R8 = 150-ohm 10-watt wire-wound type

TUBE SOCKETS
BOTTOM VIEW

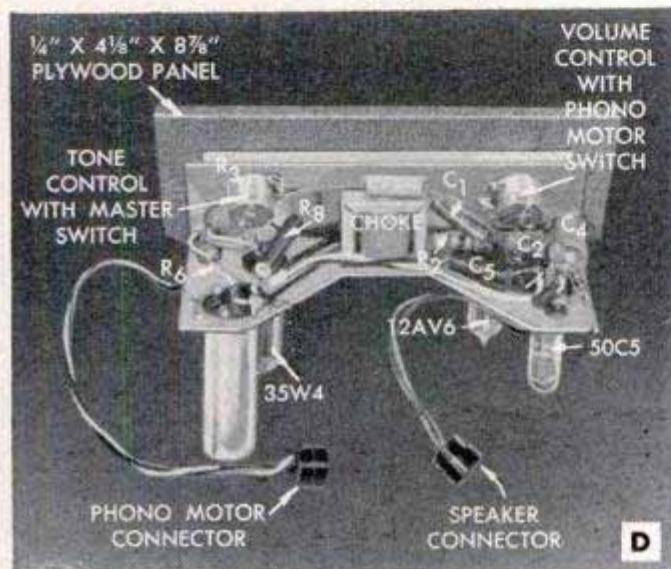
FIG. 3

CHANGER IN PORTABLE CASE

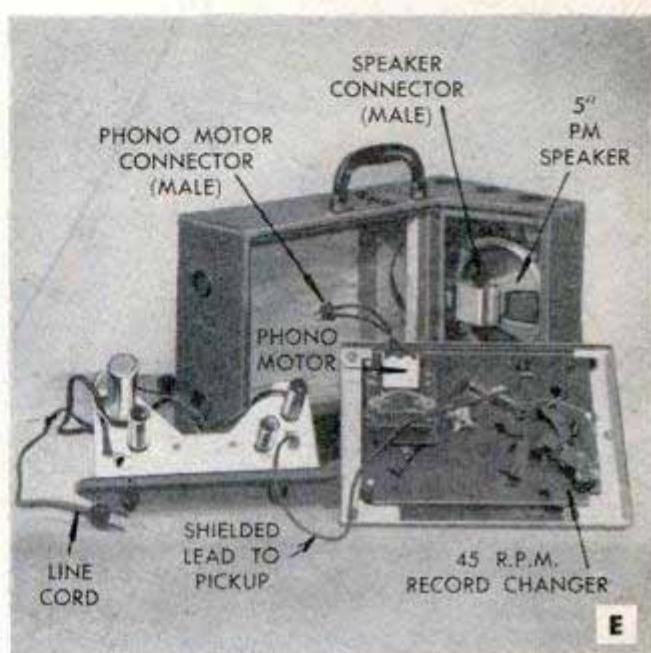
6¾ in. The drop mechanism of the changer is contained in a 1½-in.-dia. spindle and no posts or clamps are used to grip the records. Cutaway drawings, Figs. 5 and 6, show this mechanism, which is claimed to be trouble-free. The records are changed quietly and the fast change cycle lasts only about two seconds.

Owing to its compact design, it is ideal for portable use in a cabinet of the type shown in photos A and B. This also houses the special highly efficient, midget audio amplifier to be described. The cabinet may be built of plywood and covered with imitation leather, as detailed in Fig. 1, or installed in a similar commercial cabinet. The record

(Continued to page 234)



c



E

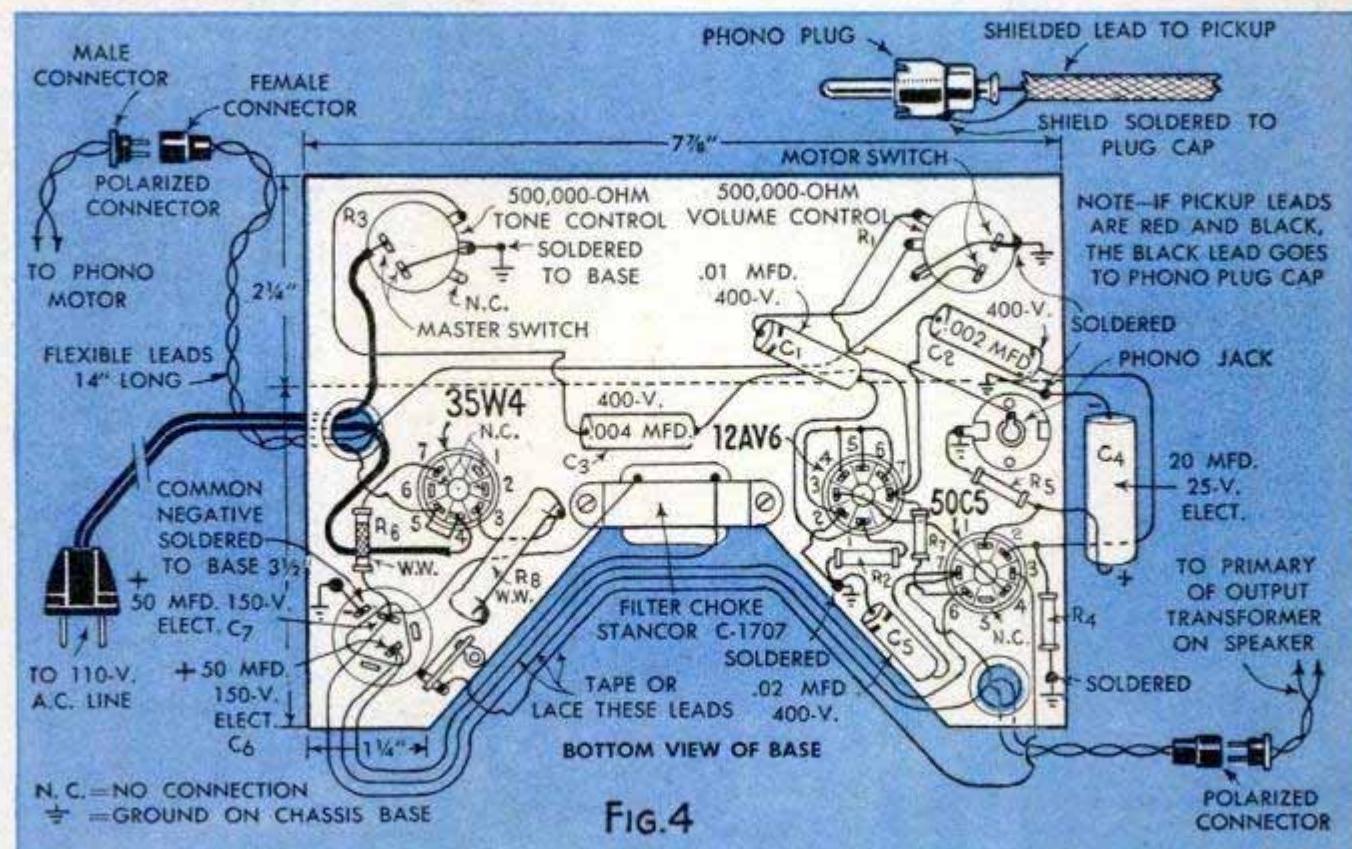
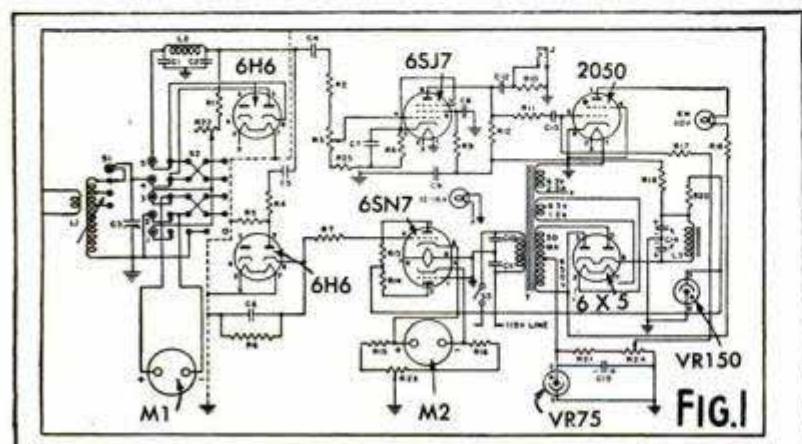
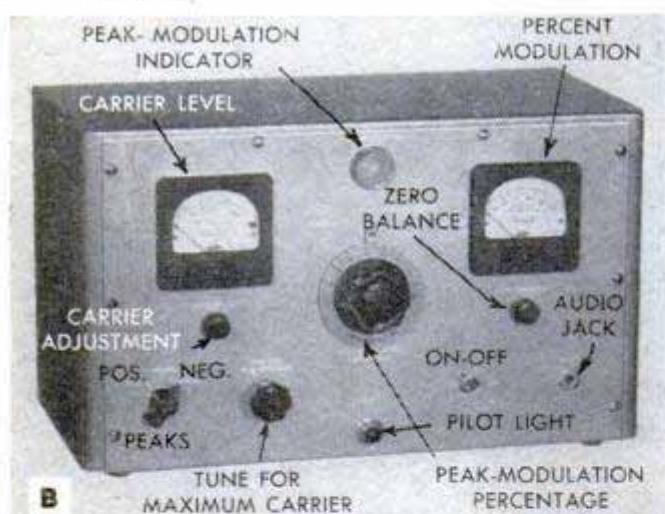
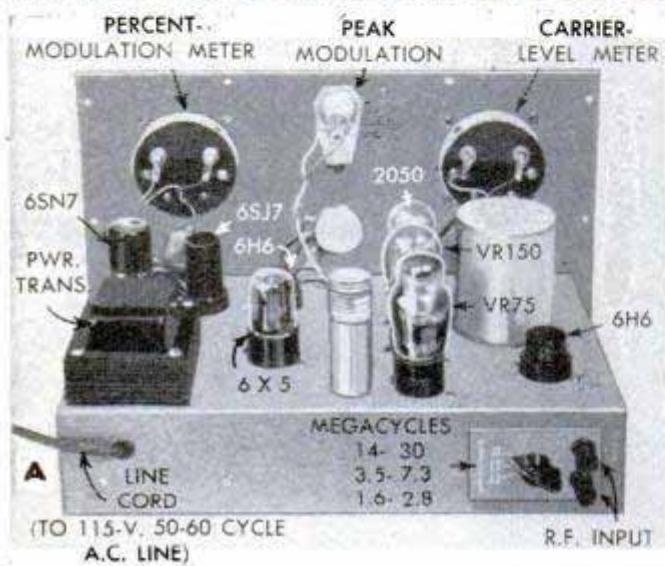


Fig.4



Modulation Monitor for Radio Hams, Police and Marine Radiophone Use

EVERY operator of a radiotelephone appreciates the importance of checking modulation in order to obtain maximum efficiency from the transmitter, and to avoid causing unnecessary interference. There are several methods for doing this but usually they are not as efficient as they should be. The Triplet 3296 modulation monitor illustrated is of special interest to the discriminating radio amateur as it will continuously monitor the carrier level, percentage of modulation, modulation peaks and also provide for monitoring of the audio component by means of headphones.

The peak indicator may be preset for any percent of modulation from 20-120, and will provide instantaneous flash when the predetermined modulation level is reached. A rear view of the chassis is shown in photo A; the circuit diagram appears in Fig. 1. The unit is housed in a metal case; the overall dimensions are 8 x 9 x 15½ in. Referring to the front view, photo B, the left-hand meter keeps a constant check on the level of the transmitted carrier. This is accomplished by coupling a small amount of the R.F. voltage from the transmitter to the tuned input coil, rectifying this R.F. voltage by the first 6H6 diode tube, and passing this through the d.c. milliammeter. A switch is employed to permit reading of either the positive or negative side of the carrier. Since the input circuit is tuned to the transmitter frequency, any change is noted by a decrease in the carrier-level-meter reading.

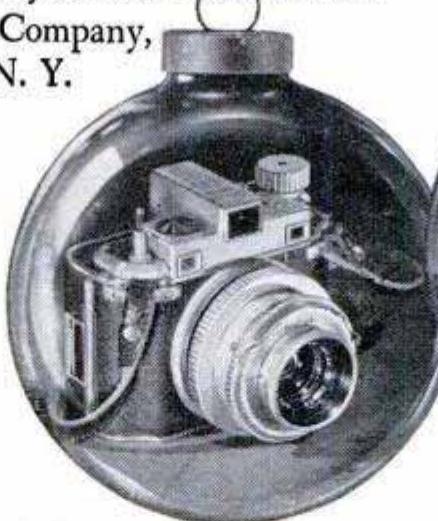
To measure the percentage of modulation, two separate indicators and circuits are used. One indicator is the right-hand meter which measures the actual percentage of modulation. The other modulation indicator is the light located near the top center of the panel. When the large center knob is set for the desired percentage modulation, the lamp will light when that percentage of modulation is reached in the transmitter, thus permitting control of the transmitter to maintain any desired percentage of modulation. This is done by taking the output of the first 6H6 and passing through a 6S7J amplifier. The output of the 6S7J is impressed on the grid of a 2050 Thyratron tube which operates as a relay to trigger the flash lamp, giving instantaneous flashes without lag. Audio monitoring of the signal is also obtained in the 6S7J amplifier output.



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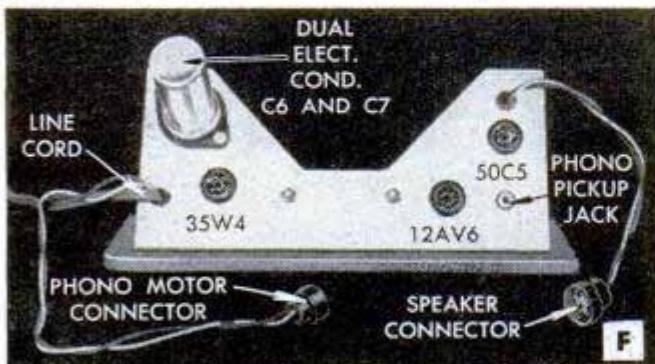
Kodak Tourist f/4.5 Camera
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Amplifier for 45 R.P.M. Record Changer in Portable Case

(Continued from page 231)

changer requires only a 3½-in. space above the base plate and 3¼ in. below. The cabinet shown is designed to house the amplifier on a metal chassis supported on the back of the plywood control panel. This chassis base is detailed in Fig. 2. The cutout section allows clearance for the 5-in. PM



loudspeaker. Good ventilation is provided for by means of ventilating hole plugs and these should not be omitted. These plugs have a fine wire screen inset in a ring with spring flanges, and are to be found in radio-parts catalogues. The loudspeaker hole also should be backed with wire screen to protect the speaker cone.

Before starting construction of the amplifier or portable case, it is a good idea to study the various diagrams and photos carefully. Photo A shows the completed unit in the case ready for carrying; in photo B, the lid is raised to show the controls. The lid is conveniently detachable as indicated in photo C; this photo also illustrates the method of stacking the records.

The schematic circuit diagram for the amplifier appears in Fig. 3, and a pictorial wiring diagram is shown in Fig. 4. This pictorial diagram is a detailed underside view of the amplifier chassis shown in photo D, and the chassis base has been flattened out to show each part clearly. Top views of this base appear in photos E and F. A polarized connector is employed to connect the record-changer motor to the line supply; a similar plug and socket connects the output of the audio amplifier to the primary of the output transformer which is mounted on the speaker. With this arrangement, it is a simple matter to remove the amplifier chassis and the record changer from the case without having to unsolder any connections. A type 12AV6 duodiode miniature tube is used in the input stage of the amplifier, and a new type 50C5 miniature pentode tube is employed

(Continued to page 236)

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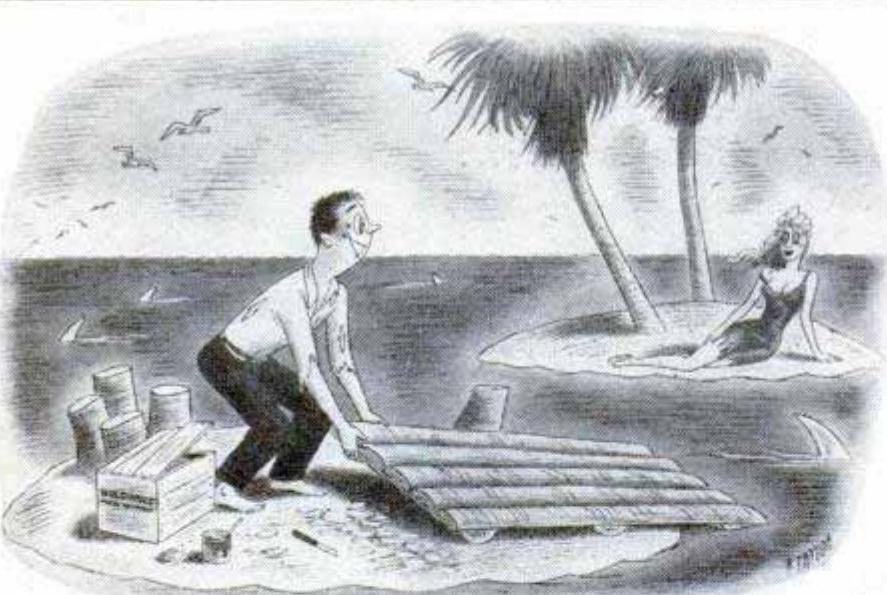
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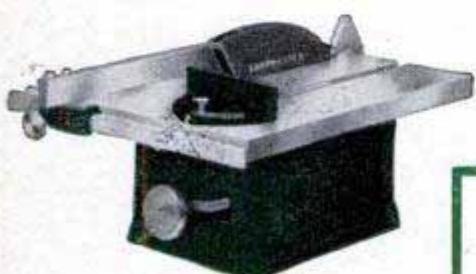
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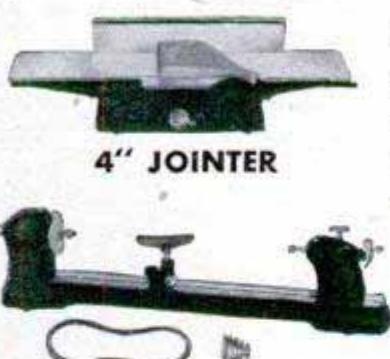
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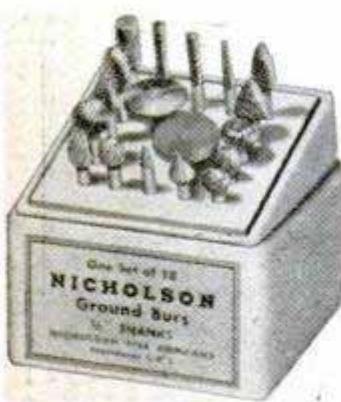
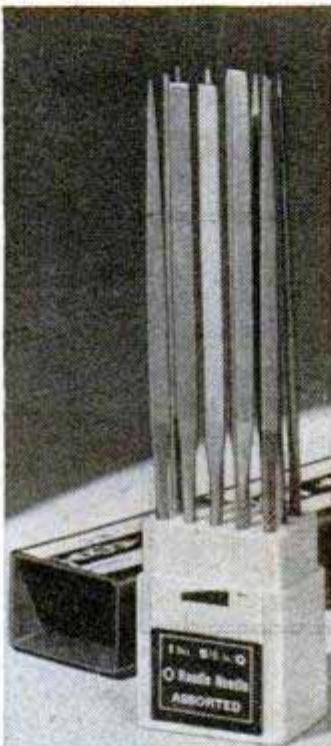
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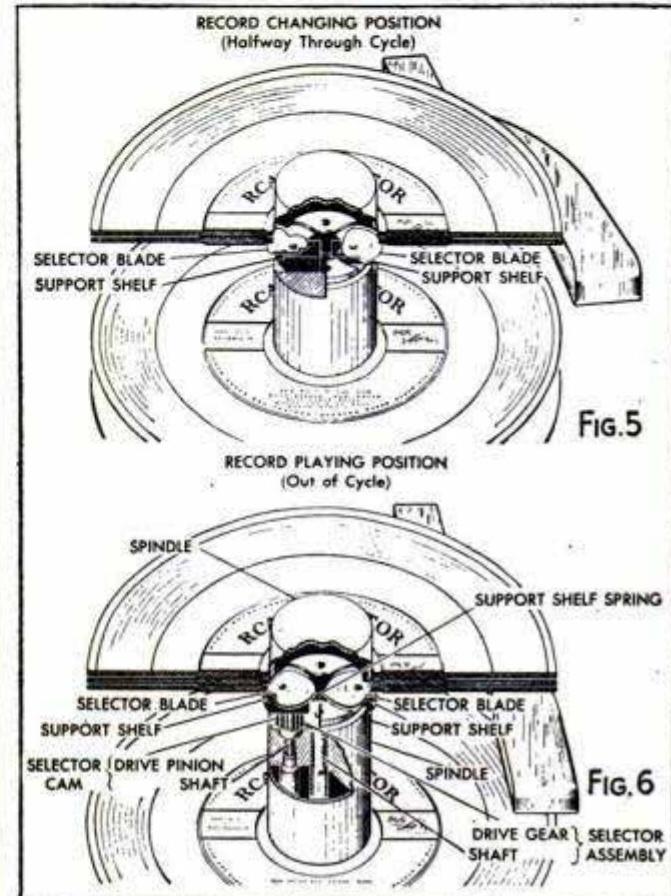
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in the output. The rectifier is a miniature 35W4 half-wave type. Wire the circuit carefully and check your wiring with both circuit diagrams. Use rosin-core wire solder and No. 18 or 20 hookup wire with push-back insulation. This excellent little amplifier includes volume and tone controls, and the output is sufficient for a large room. These midget controls include the s.p.s.t. switches; the master switch is on the tone



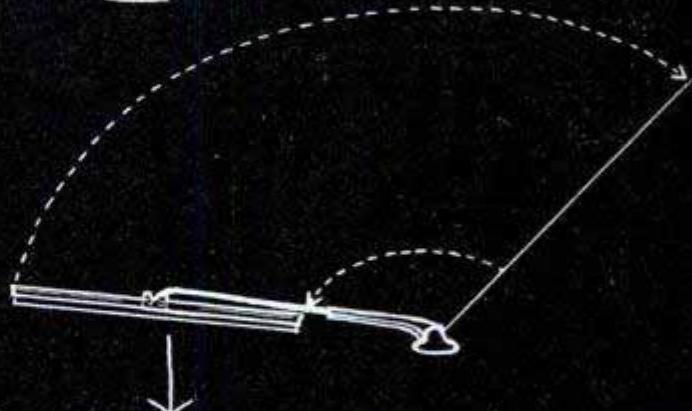
control. When operating the unit, this switch is turned on first to permit the amplifier to warm up. When the tubes have warmed up, turn on the volume control which also closes the motor switch. The volume control can then be advanced to the desired volume.

When stacking the records over the center post for automatic operation, place the desired selections upward, the last record to be played on top. Turn on the volume control and motor-drive switch; then push the "start-reject" knob on the changer plate to "start" and let go. The mechanism will then automatically play in sequence one side of each record stacked on the separator shelves. To reject a record being played push the "start-reject" knob to "reject." At conclusion of playing, and as the last record is being repeated, lift the tone arm and place it on the rest and turn off the motor switch. Detailed student material list R-384 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

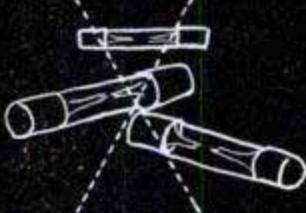
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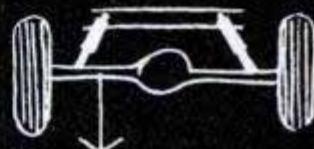
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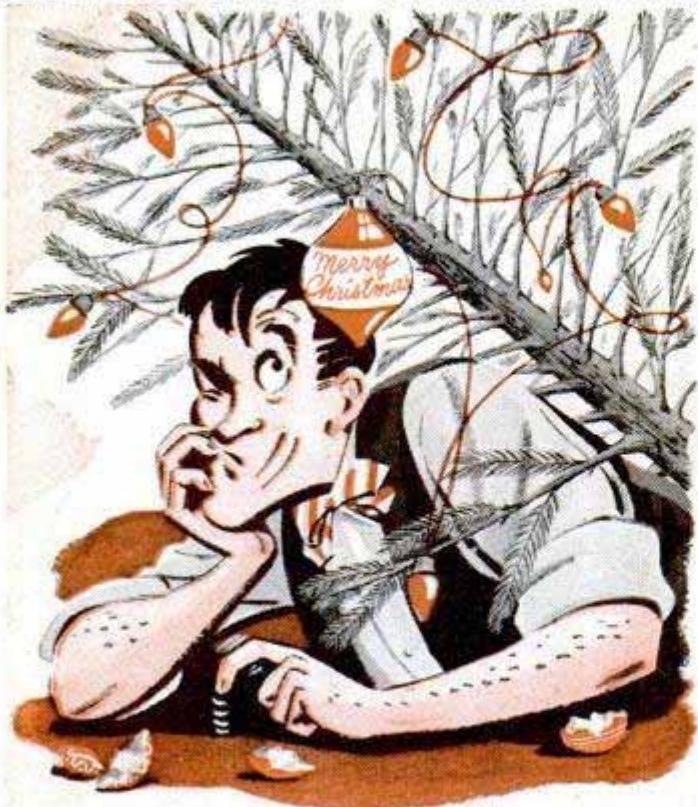
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consideration for you that has gone into the major parts. Into the gliding softness of Plymouth's famous Air Pillow Ride. Into the greatly increased vision provided by the beautiful new body design. Into the lively power of 7 to 1 compression ratio. Into many advantages exclusive with Plymouth in the low-priced field.

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**CONTROL OIL-PUMPING
WHERE IT STARTS—REPLACE WITH**

FEDERAL-MOGUL



BEARINGS

Calendars With Wings

(Continued from page 101)

projector, the film loop runs through again and again while he watches the action. After he has studied the movement hundreds of times, he knows exactly what happens to each bird at any given moment, and can stop that bird in flight on the canvas. He knows wild fowl so well he can change a mallard on the film to a pintail on his easel.

It is this feeling of motion, derived from his movies, which makes Bishop's art work come alive. Gazing at a Bishop painting, you can feel the marsh wind on your cheek, see the lift of the wings, the splash of water and the power of the bird.

The artist has spent weeks in the field with Edgar M. Queeny, famous sportsman, photographing wild fowl. The men frequently compare their sequences. They know now exactly how a bird flies.

Many of the sequences prove beyond doubt that all surface-feeding ducks fly straight up and out of the water. Sportsmen and bird authorities have been misled for centuries into believing that ducks leap into the air and then start their flight. Actually, the duck carefully unfolds its wings, lays them on the water and then with a mighty downthrust drives itself straight up and clear of the surface. Then, so fast the eye can't see the movement, the bird makes a recovery stroke, thrusts down again, this time on the air, and becomes completely airborne.

Not so the sea and diving ducks. Like overweight planes, these birds must run rapidly along the surface, flapping their wings until finally they build up enough speed to become airborne.

Performing the same function as the rudder and stabilizer of an airplane, the bird's tail helps determine the direction of flight. Bishop says the tail is made of 16 to 20 short flight feathers embedded in a base which contains more than 1000 tiny muscles to control them.

He claims that his movies prove ducks and geese can perform any stunt accomplished by an aviator. He has pictures of ducks flying backward, upside down, standing still in the air like a helicopter and looping the loop. One picture shows a baldpate coming in for a landing when suddenly it encounters a reverse air current and tumbles into the water with a tremendous and embarrassing splash.

Mallards, when they are frightened during a getaway, speed their wingbeat up to 10 or 12 times a second, but throttle down to 8 when cruising. Through Bishop's

(Continued to page 244)

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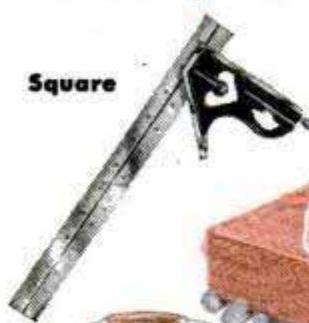


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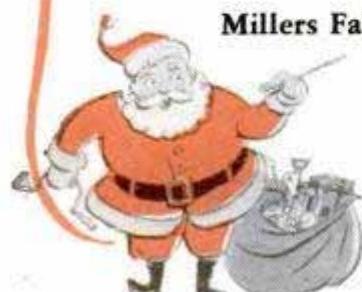
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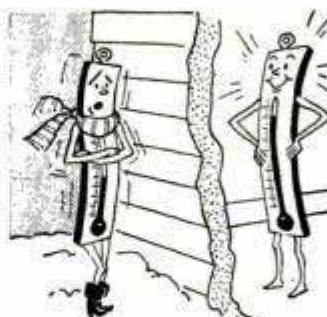
As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of Popular Mechanics invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

Leveling Cracked Plaster

Q—The plaster on walls and ceilings of two rooms in my home is quite badly cracked and uneven in places as a result of the plaster being raised on one side of the larger cracks. I cannot paper over the walls or ceilings because of the poor condition of the surface. What do you think is best to do, re-plaster, or try leveling the old plaster? How does one level plaster in this condition?

C. A., Coffeyville, Kans.

A—Of course, replastering both walls and ceilings is the best and surest repair. You do not state what kind of lath is under the plaster or whether the building is old or comparatively new. The question, however, is whether it would pay to expend the hand labor necessary to level the ridged and broken plaster. In any case, all loose plaster must be removed and the areas patch-plastered. A portable electric disk sander could be used to level the ridges, but this would be a dusty, disagreeable job. The principal objection to this procedure is that in some cases it will be necessary to reduce the thickness of the plaster to such an extent that it may break up, or the brown coat will be exposed over a considerable area. If the offsets at the cracks are only slight (1/16 in. or less), then it is practical to level the ridges by hand-sanding with medium-grit sandpaper. Brush out all the loose material and fill the cracks with a crack filler made especially for this purpose. Then size walls and ceilings before hanging wallpaper.



Wall Condensation

Q—Will you explain wall condensation and how it became a serious problem in ordinary house construction? What is the cause, that is, what actually happens between the inner and outer walls, and how does one prevent it, if that is possible? W.F., Indianapolis, Ind.

A—Space does not permit an extended discussion of this problem, but perhaps a basic cause of wall condensation can be outlined briefly. Because of what is known as vapor pressure, air containing moisture escapes through the walls and ceilings of the house when the outside temperature is lower than that inside the building. At the same time, heat loss through an uninsulated wall tends to prevent a lowering of the temperature within the wall to the condensation point. For this reason,

(Continued to page 242)

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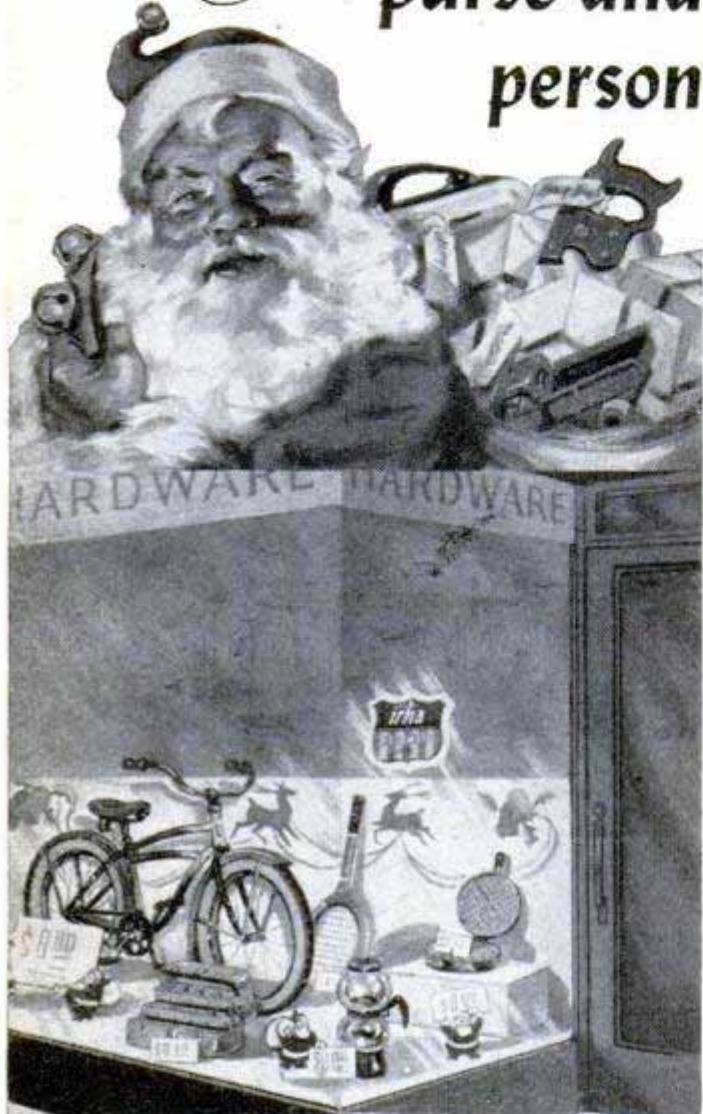
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NATIONAL RETAIL HARDWARE ASSOCIATION

such walls remain comparatively dry. Some years ago, when house walls were insulated with sawdust and other fine materials, the insulating properties of these materials greatly retarded, but did not entirely prevent, the passage of heated, moisture-laden air through the walls and ceilings. This slowing up of the process of air and heat transfer usually resulted in a gradual lowering of the temperature within the walls to a point where the water vapor in the air condensed, generally on the inner surface of the sheathing boards. At this point, the beads of moisture formed frost if the temperature was sufficiently low, or penetrated the sheathing and siding to the paint film if the temperature at the inner surface of the boards was above the point where frost would be formed or condensation take place. This penetration of moisture through the boards from the back is a cause of peeling paint, rotted framing and a general condition of dampness throughout the whole structure. Manufacturers of insulating materials in various forms have developed vapor barriers which are installed along with the insulation in the form of moisture-resistant covers, or "envelopes," for the insulating material itself, and also in separate sheet forms which are tacked over the studding under the plaster. These barriers are fully effective only if they are installed in accordance with the manufacturer's instructions. In houses with insulation in walls and ceilings but without vapor seals, reducing the humidity in the house will lessen the possibility of trouble that is caused by condensation.

Hanging Storm Sash

Q—My home is quite old and the window frames have deteriorated along with the rest of the structure. My storm windows do not fit as tightly as I believe they should. How can I obtain a tight seal between the storm sash and the frame?

R.F., Green Bay, Wis.



A—Although there are several materials that can be used for this purpose, one of the simplest ways to seal the sash is to glue or tack strips of $\frac{1}{8}$ x $\frac{3}{4}$ -in. felt to the inside edge of the sash frame all around and also across the bottom rail. If the surface of the sill is irregular or the window frame is out of square, it may be necessary to use two thicknesses of felt across the bottom. Plane the top of each sash to a bevel of about 5 deg. to prevent water running down between the sash and the frame. Installation of the felt strips probably will prevent use of the sash hangers. It is better when sealing the sash in the manner described to use turn buttons as fasteners. After placing the storm sash, screw the turn buttons up tightly.

Open Shutter Joints

Q—I have stationary ornamental shutters of the paneled type. Recently the shutter frames have either shrunk or expanded (I don't know which) and have exposed an unpainted strip along the sides of each panel. How can I prevent this? J.A., Reading, Pa.



A—When this occurs it's a fairly reliable indication that the moisture content of the wood in the shutters was unduly high at the time of installation and painting. There is no immediate remedy in the sense that the tendency of wood to alternately shrink and swell can be entirely prevented or corrected. However, removing the shutters and storing them for a time in a dry place before repainting and rehanging will probably help to minimize the trouble. If the joints have opened, it might pay to pry them apart and reglue the joints with a waterproof glue. This would have to be done carefully to avoid marring or splintering the wood. Be sure that the glue is dry before repainting.

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amazing pictures, these rapid beats look almost leisurely. He has contributed parts of his films to Ducks Unlimited, the conservation organization, for use in raising funds to preserve the birds he paints.

Bishop also has made a detailed study of the physiology of wild fowl, with emphasis on the wing structure. He'll tell you, for example, how a bird "zippers up" its feathers. Each feather is composed of hundreds of parallel barbs. Projecting from these barbs are hundreds of tiny, invisible barbules which interlock with those on adjacent barbs. And the barbules in turn have microscopic, hooklike barbicels that branch out to seize adjoining barbules like grapnels. These millions of barbicels provide a tight grip to bind together the parts of the feather.

Now, if you ruffle a feather the wrong way, you'll break the hold of these millions of barbicels. Smooth it back the right way and Nature will zipper up the wing again as the barbicels grapple each other.

All of this knowledge, absorbed in a lifetime of bird study, somehow is built into each painting as Bishop deftly covers the canvas. When you see a baldpate rising over the marsh grasses in one of Bishop's paintings, you see it over the barrel of a gun. It's your duck, the one you bagged last fall or the one that scudded over the

treetops just out of range during your last day in the field.

Bishop sends these finished paintings to Brown & Bigelow where they are photographed and then printed on large-size calendars. His work also has been reproduced in two books and he has illustrated Prairie Wings, a book written by Queeny, his fellow sportsman.

But painting wild fowl is just a small part of Bishop's work. It has become a challenge to him to depict his beloved birds in as many different media as possible.

He fires etchings on glassware and smoking accessories. He makes the molds for beautiful fireplace tiles, each of them showing a different bird in a different stage of flight. He hand-prints his birds on fine linens. Dinner plates become decorative pieces when etched with his colorful wild fowl. He also molds beautiful jewelry pieces and silver buttons to carry out his themes.

Craftily placed in all the paintings and etchings are lures that coax the sportsman back to the marsh. The hunter likely will find himself reflecting that the chuckling and gabbling of mallards as they dive for acorns that have fallen to the bottom of some shallow, flooded timber are far more appealing sounds than the conversation of business associates or even of friends.

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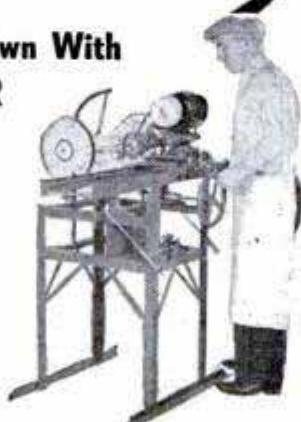
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SOFAR—The Navy's Lost and Found Agent

(Continued from page 169)

designated depth, it ruptures the small diaphragm, releases a firing mechanism and explodes the bomb.

SOFAR signal bombs are now being manufactured by the Thomas A. Edison Co., West Orange, N. J.

At the same time that the bomb was being developed, work was also under way on setting up the SOFAR monitoring stations. To determine the characteristics of the ocean—and especially the salinity, pressure and temperature in the speaking-tube zone—Navy and civilian scientists spent months aboard seagoing laboratories in the Pacific. They ran deep-sea power winches and lowered Nansen bottles to collect samples of sea water. They plotted depth and position by means of echo sounders and signals sent by SHORAN stations on land.

Another purpose of these long, seagoing experiments was to determine the best locations for the underwater hydrophones which pick up the bomb's explosion. These hydrophones, usually three in number, are encased in a pyramid-shaped, perforated metal cage. They are connected by submarine cable to the monitoring equipment

ashore. For best reception they are located in the center of the sound channel and strategically placed so that undersea ridges or submarine canyons will not interfere. Duplicate hydrophones and cable installations are made at each station so that service may be continued in the event of failure of one of the units.

Originally, for example, it was decided to put one of the monitoring stations at Monterey, Calif. But a deep and twisting submarine canyon just offshore made it impossible to find a suitable location for the hydrophones. So the station was moved south to Point Sur. In the Hawaiian Islands, Hilo also was considered a possible SOFAR monitoring location. But steep and rocky offshore conditions ruled it out also.

Once the three stations were located, there followed a long period of testing and checking on the performance of equipment. Some unusual sea sounds were picked up—schools of whales cruising by, near-by explosions on shore and even the rumble of volcanic activity in the Hawaiian Islands. Ways to lock out the unwanted sound had to be devised.

Here's how the monitoring stations work:

Three stacks of automatic monitoring equipment are on duty day and night. When a SOFAR signal starts coming in,

(Continued to page 248)

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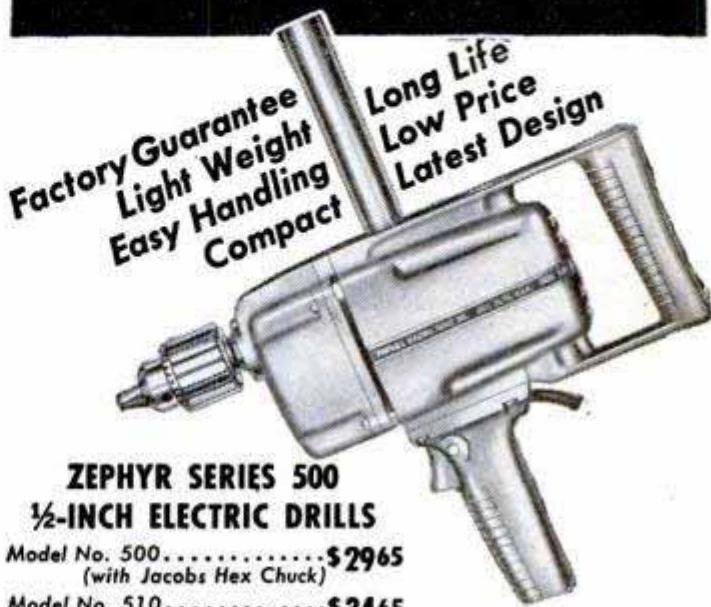


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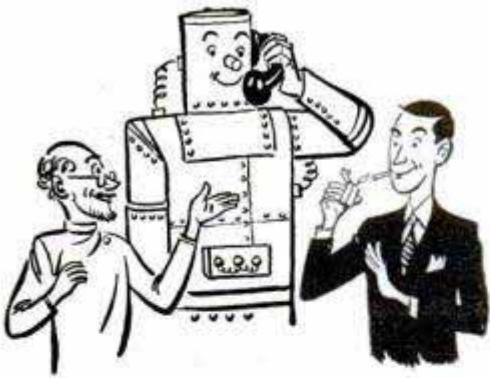
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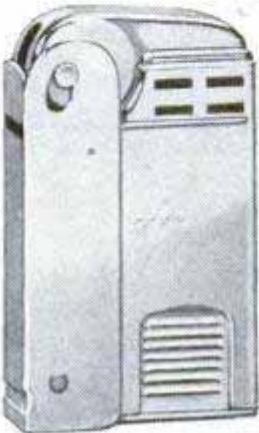
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things begin to happen. An alarm bell starts ringing to attract the attention of the operator. The wavy line on the two recording paper tapes begins to veer up at a jagged angle. A magnetic wire recorder captures the sound of the signal so that it may be re-recorded if necessary.

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Upon receipt of the information from the three monitoring stations, the control center gets a "fix" from special SOFAR charts and a table of probable time lapses. By quick, rule-of-the-thumb figuring, the control-center navigation officer can determine the location of the crippled ship or plane within 10 miles. A rescue plane is dispatched immediately. After a more careful check is made, the navigation officer radios a correction to the rescue plane which should be accurate within one mile.

The Pacific continues to be explored by Navy scientists with a view toward extending the SOFAR network in the future. Monitoring stations may be set up at Midway Island and other locations. And when the northeast Pacific is blanketed, SOFAR may be set up in other areas crisscrossed by heavy sea and air traffic.

The New Breed of Sports Cars

(Continued from page 84)

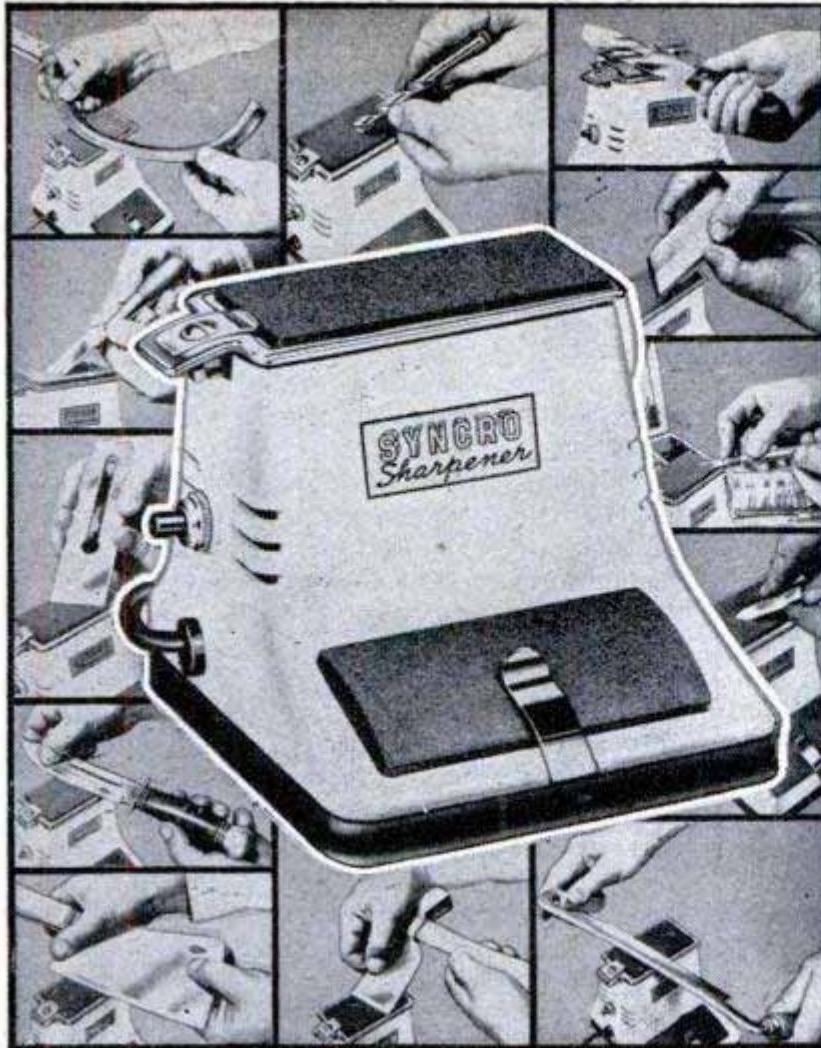
of Fiberglas, lighter and far more resistant to damage than metal.

The car has independent front suspension with semielliptic springs in the rear. One unique feature is the telescopic steering column that has four inches of travel and may be pushed or pulled to a position that is comfortable to the driver. The car is equipped with a convertible top and has removable Plexiglas side windows. It weighs 2300 pounds.

After exhaustive testing of the chassis in traffic and over rough mountain and desert roads, production of the first dozen units was started several months ago. Price is in the \$4000 range. The car may be purchased in knocked-down kit form at about half the assembled price. No special tools or skills are needed for putting it together and the car can be assembled ready for the road with about three weeks of work.

What some engineers rate high among sports cars, here or abroad, is a custom job completed late this summer by Dietl & Lesovsky, Culver City race-car builders,

(Continued to page 250)



Hones all these sharp — hundreds more!

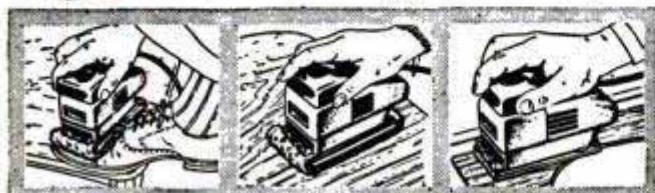
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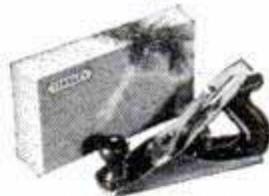


Stanley No. 908, 23 tools and chest. Fine selection of tools for the woodworking hobbyist.

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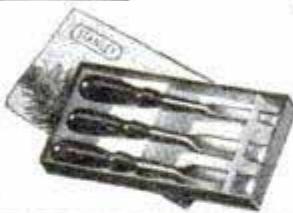


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for Sterling Edwards of Beverly Hills. Of trim modern design, the car is a high-performance, general-purpose convertible coupe. It is intended also for competition in road races and sports-car events, and when stripped for racing has a top speed in the neighborhood of 120 miles per hour.

In city traffic, the Edwards car is simply a small automobile of outstanding lines. From its appearance, no one would guess that it can outclimb many motorcycles on steep motorcycle hill-climb courses or that its stability is so great that it can be maneuvered violently at 80 miles per hour in perfect safety. In tests it has been accelerated so rapidly from a standing start that it leaves rubber behind for a full city block. In second gear it hits 75 miles per hour. It floats across chuckholes and washboard roads that would hammer most cars to pieces. The rear end squats when the brakes are applied, bringing the car to a stop, under control, in considerably less than average distance.

These sound like fantastic claims and they are, judged by ordinary standards. They were proved, however, by 3000 miles of test driving of the bare chassis before the body was installed. Edwards, several race-car drivers and engineers all had a hand in testing the car on race tracks, hill climbs and in traffic and on winding mountain roads.

The car has a 100-inch wheelbase, is 13 feet 8 inches over-all and stands 53½ inches tall. It weighs less than a ton. There is room for four people and the car is equipped with a demountable "hard" leather top. The engine is a 60-horsepower Ford V-8 rebuilt with Eddie Meyer racing parts to produce 120 horsepower. The radiator is of special design.

The frame is in the form of a closed "H" and consists of electrically welded 4-inch chrome moly seamless aircraft tubing, joined and baffled so that the frame may be used as an auxiliary fuel tank of 13 gallons capacity. The car's regular fuel tank holds 25 gallons.

The front suspension, employing coil springs, uses stock parts modified in design to improve the stability. The steering ratio is 8 to 1, permitting quick maneuvering with only a partial turn of the steering wheel. The rear wheels are independently suspended on trailing arms and are fitted with torsion-bar springs. The design is a modification and improvement on an older European suspension principle. To help reduce the unsprung weight, the differential is fixed to the frame and each rear axle is provided with its own universal joint.

(Continued to page 252)

NOW

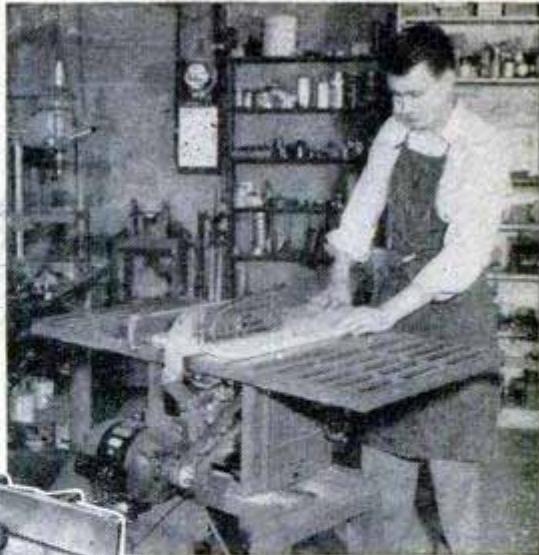
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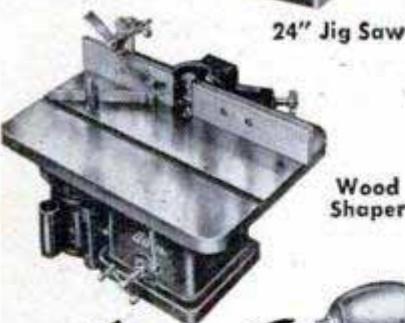


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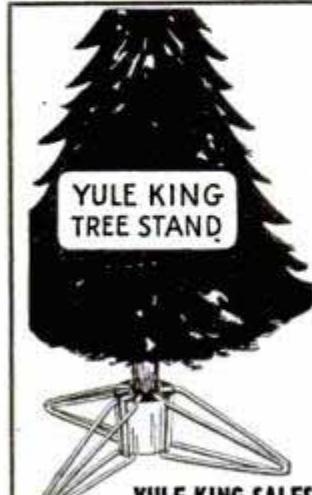
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Edwards and Norman Timbs, the design engineer, spent several months in study and research before construction started. A complete set of chassis drawings was made so that each part of the car could be reviewed ahead of time. Several separate $\frac{1}{4}$ -scale clay models of proposed bodies were built up and modified before arriving at the final appearance of the car. At one time, four different shapes of fenders were all on the same model to permit selection of the best. From the final clay sculpture an identical model was built of wood and the full-scale body measurements were taken from the wooden model. From these measurements, a full-size body mock-up was built, from which the body builders obtained their dimensions and to which they fitted each aluminum body panel. Including all the experimental and test work, the cost of the car is close to \$20,000. Several additional cars from the same plans may be built later.

Listen to the Falling Stars

(Continued from page 163)

miles or so above the earth increases in summer and decreases in winter. This seems to be associated with the seasonal warming and cooling of the ground. Day-to-day changes in ground temperatures have no effect on upper-air density, nor are storm fronts responsible for changes in density. On the whole, the extreme upper atmosphere appears to be very patchy or even cloudlike in texture.

From studies of shower meteors a great deal more may be learned about comets. Shower meteors appear to be the debris from a comet's tail and they may provide clews that indicate just what a comet is, where it came from and why it disintegrates.

From radio research on meteors it is hoped to learn more about freak conditions that sometimes vastly extend the range of short-wave transmitters or cause interference between widely separated stations. The ion columns or clouds that are caused by the passage of a meteor may be involved in this phenomenon.

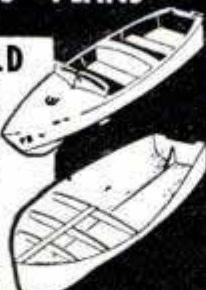
Another question, still to be answered, is why the ionization produced by a large meteor appears to hang on stubbornly instead of disappearing quickly. There is a chance that these ion columns may be a source of cosmic-ray bursts. There is a chance, too, that the research will yield concrete information about "contra terrain" matter, the theoretical atom in which the negative charges are clustered in the nucleus and the positive charges are outside, just the opposite of the accepted atomic state.

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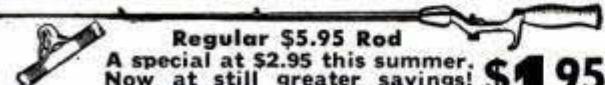
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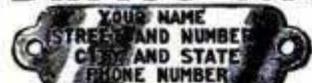
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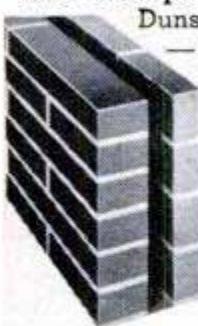
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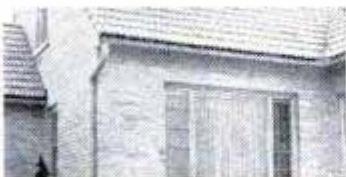
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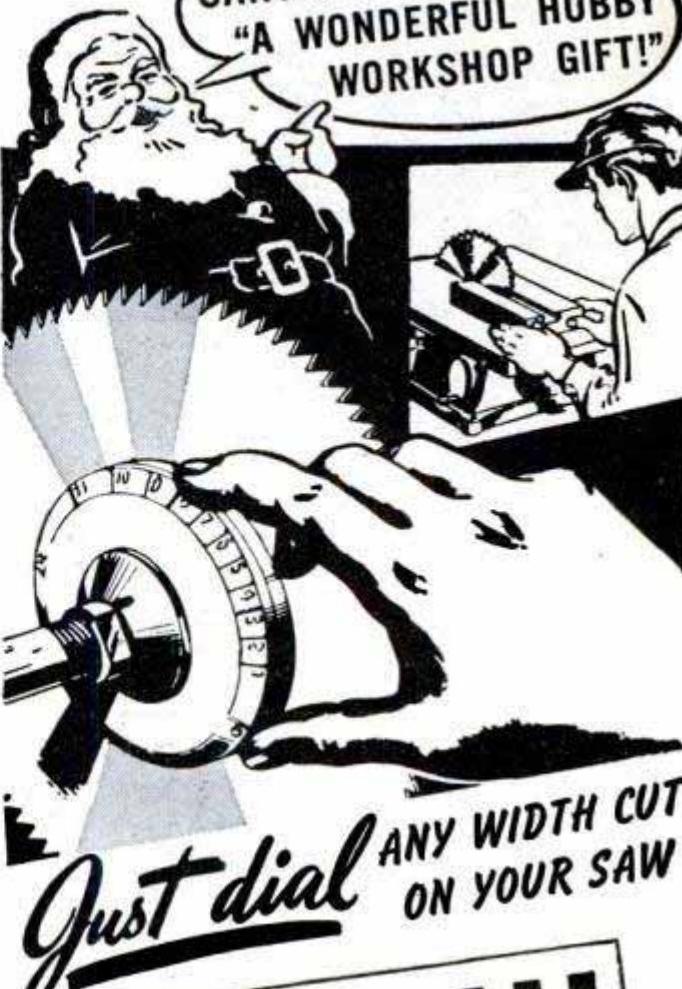


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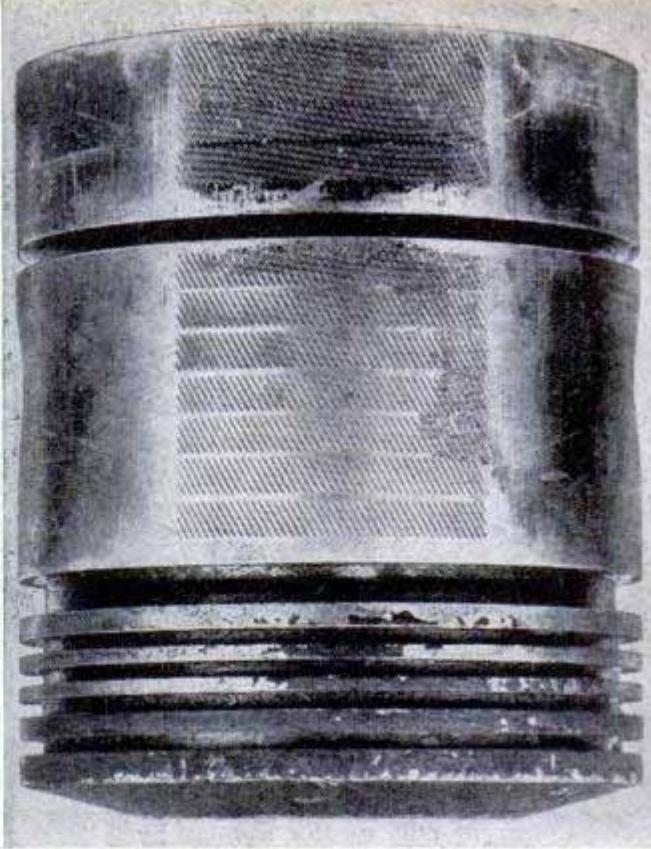


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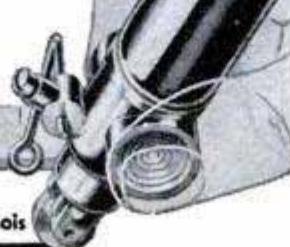
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SAY YOU SAW IT IN POPULAR MECHANICS

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flip of this
switch



1/3 h.p., single
phase, 115v.

this motor
REVERSES instantly

Now available at a popular price—a single phase motor that reverses instantly at the flip of a switch. Starts in either direction. Idles to a stop or stops immediately by applying switch. The newly invented Iron Fireman Reverswitch built into this motor gives it the versatility of a three-phase motor.

Note these quality features: *Shielded Ball Bearings*, permanently lubricated; *Totally Enclosed* to keep out dirt; *Overload Protection*, automatic reset; *Capacitor Start*, high starting torque.

You can do things with this motor that you could never do before on such applications as lathes, conveyors, hoists, dumb waiters, garage doors, etc. Complete, ready to plug in—\$39.50 express prepaid. If not at your dealer, order direct. Write for free literature. Iron Fireman Manufacturing Co., 2838 S.E. 9th Avenue, Portland 2, Oregon.

 **IRON FIREMAN**
Reversing
MOTOR

THAT ACCURATE TOUCH...



with the
FINEST
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It's easy to be right the first time—it's easy to get "that accurate touch"... if your measuring instrument is the Master Streamline. This fine tool simplifies and speeds measuring and cuts down time-wasting errors. Its outstanding features are Streamline's guarantee of better measuring...graduations on both sides of blade...new lever brake to hold reading...direct reading inside measure...extra long tip holds blade steady...and many others found only in the Master Streamline. See your local hardware dealer or use the coupon.

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WOOD AND STEEL TAPE RULES

Master Rule Mfg. Co., Inc.

201 Main Street, White Plains, N. Y.

PM-12

I enclose \$2.25 for the 6 ft. Streamline

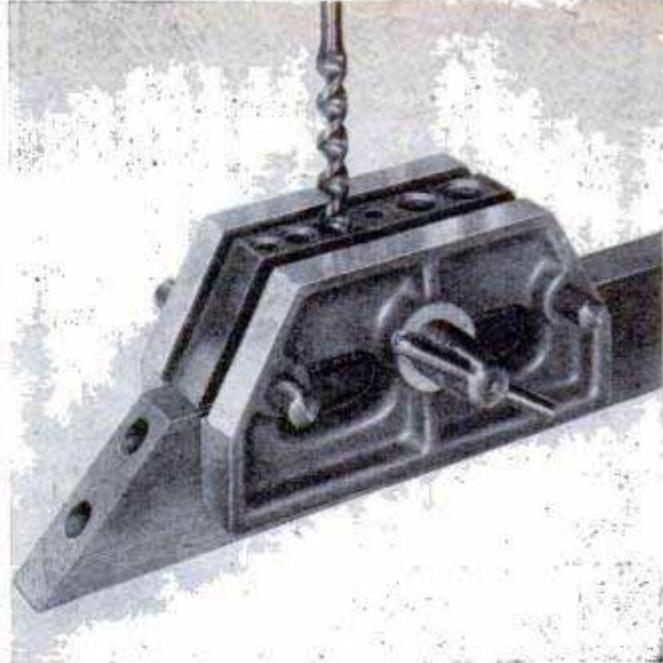
\$2.50 for the 8 ft. Streamline

Engrave my name (75c extra). Please print clearly:

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Dowel Drill Guide

Woodworkers can accurately center dowel holes with a new drill guide that holds the material like a vise. When the workpiece is clamped in the tool, the guide holes for the drill are automatically centered over the work. The jaws will clamp on work up to two inches in thickness. The guide accommodates five sizes of drills.

Ash Catcher for Cigarettes

Sparks and ashes won't fly around in the strongest wind when the cigarette is smoked inside a briar sleeve that fits on the end of a cigarette holder. For those who must smoke while in bed, it eliminates the danger of fire because the hot end of the cigarette cannot touch the bedclothes. Motorists who smoke while driving are protected against flying sparks which often burn holes in clothing and upholstery.



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KEEPS THE COLD OUT

Cordlike and pliable, Mortite is the perfect weatherstripping. Goes on in a jiffy without tools or tacks. Keeps out wind, dust, dirt. Anyone can press it around windows, doors, transoms, baseboards. Weatherstrip a whole window for 29¢—costs even less if you use the larger package. Get Mortite at stores or write for circular. J. W. Mortell Co., 522 Burch St., Kankakee, Ill.



29¢ and \$1.25
Higher West of
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Sand Casting — Forging — Heat Treating — Case Hardening
BRONZE FOUNDRY



In your own workshop allows you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STATIONARY ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1½, 3 and 6 pounds weight, aluminum, copper, brass, etc., \$22.50, \$29.50, \$42.00 f.o.b. Kansas City. Domestic gas supply and 110 volt AC or DC energy required for operation. Write for circular.

KANSAS CITY SPECIALTIES CO.
Box 6022, Dept. P-11 Kansas City, Mo.



FREE TO HOME PLANNERS

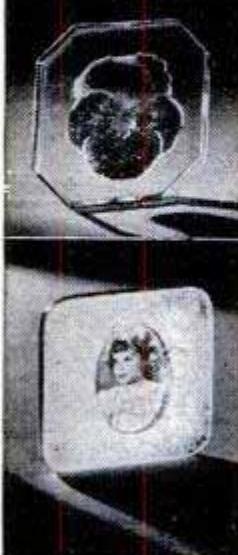
"Little Blue Booklet" of 29 popular plans sent FREE to acquaint you with our MONEY SAVING home planning service which includes 1200 Tested Designs; beautifully illustrated plan books; working drawings; material lists; specifications—all at LOW COST. Write today for FREE BLUE BOOKLET and complete information. America's pioneer residential plan service.

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Plastic Coasters and Tiles



EMBED REAL FLOWERS in NEW Magic PLASTIC

Now, create many unusual things like the distinctive pansy coaster shown—made by embedding real pansies in Castolite—the "magic" liquid plastic that "pours cold like honey... sets at room temperature like glass." Comes crystal-clear or may be dyed for brilliant color effects. Embed other flowers, too, also coins, medals, stamps, butterflies. Cast gorgeous bookends, art objects, figurines for gifts or to sell. New pleasure, fine profits are possible. No special artistic ability required.

EMBED YOUR PHOTOS

Preserve your treasured photos in Castolite. Make beautiful medallions like the one shown, unusual photo-lampshades, lamp bases, distinctive paperweights with embedded photos. Sell your photos in unique plastic mounts. Use only home utensils. Follow simple step-by-step method. Write for free literature showing how to get started. Write today.

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Look Out . . . Avalanche!

(Continued from page 93)

If a skier is buried in an avalanche, prompt organized rescue operations are the only hope of getting him out alive. There are records of persons who have lived for as long as 72 hours while buried. Ordinarily, however, they are killed instantly by crushing, or die within a short period because of exposure, shock or suffocation.

Avalanche rescue operations are divided into two phases. The first rescue party, consisting of not less than three persons, preferably 10, sets out immediately under the supervision of an experienced mountaineer. Working at maximum speed, they make a rapid search of the slide in an attempt to locate the victim quickly.

The second party, equipped for extended rescue operations with probes, shovels, toboggans, flashlights, etc., starts within 30 to 60 minutes. It includes every able-bodied person in the vicinity and takes over from the first party if hasty action is unsuccessful. In an avalanche rescue, hope is never abandoned until the victim is found.

In recent years the Swiss have developed a successful method of using trained German shepherd dogs to locate persons buried in avalanches. These animals are able to sniff out skiers buried 12 feet deep in a fraction of the time that would be required by probing.

Most avalanche accidents occur through carelessness or ignorance. But the powerful, death-dealing avalanche can be defeated if individual winter sportsmen will cooperate with the Forest Service.

"The only good avalanche," say Atwater and Koziol, "is one that has already happened—harmlessly."

The Case of the Vanishing Sardine

(Continued from page 112)

be carried away to less favorable waters where they die.

Scientists can't foresee any way of controlling these currents, but they can detect favorable and unfavorable patterns and thus may be able to advise the fishing industry whether or not to expect a good or bad year.

In addition to sardines, many other kinds of fish and fish eggs are caught on the scientific angling trips. Before the work began, some 650 piscatorial species were known to exist in California waters. By the end of the project, several years hence, it is predicted that the total number will run above 1000.

(Continued to page 260)

Alan Ladd says- Say

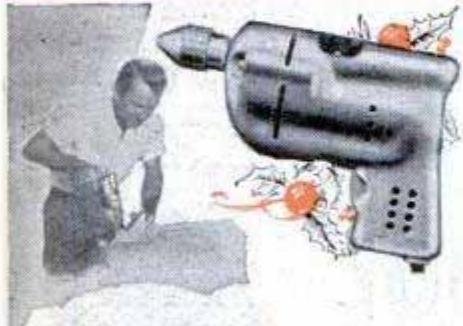
Starring in
"CHICAGO
DEADLINE"
A Paramount
Picture

Ask to see
HOME-UTILITY TOOLS at your
Hardware, Electrical or Implement
Dealer displaying this streamer

Alan Ladd says
These Gifts Ring the Bell
with MEN from 8 to 80!

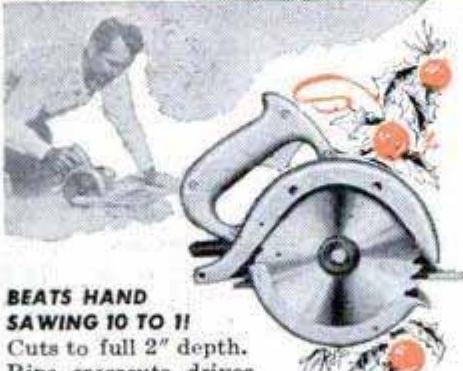
HOME-UTILITY

Merry Christmas with Home-Utility Tools!



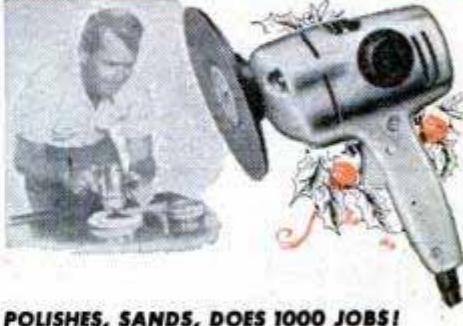
DRILLS HOLES IN A JIFFY! Ideal "all-around" tool for drilling, sanding, polishing, cleaning. Drilling capacity to $\frac{1}{4}$ " in steel, $\frac{1}{2}$ " in hardwood. Compact, light. Shaped to fit the hand. Famous "Pistol Grip and Trigger Switch".

H-U $\frac{1}{4}$ " ELECTRIC DRILL \$18.95



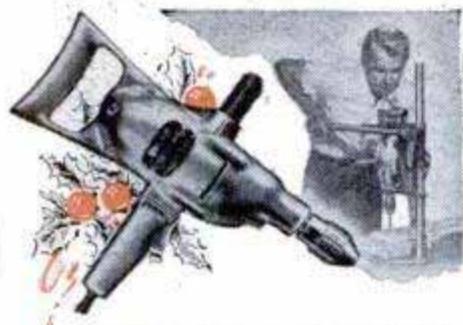
BEATS HAND SAWING 10 TO 1!
Cuts to full 2" depth. Rips, crosscuts, drives many blades and discs. Easy to handle and easy to follow. Unmatched quality at this price. Hundreds of uses.

H-U 6" ELECTRIC SAW \$59.95



POLISHES, SANDS, DOES 1000 JOBS!
One low price gives you this versatile tool complete with 3 sanding discs, lambwool polishing bonnet, backing pad, can of useful Home-Utility Electric Wax! Convert it into a speedy drill with $\frac{1}{4}$ " Jacobs Chuck (\$3.45 extra).

H-U 5" SANDER-POLISHER \$29.95



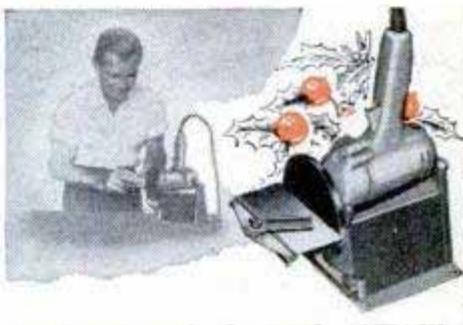
A BIGGER DRILL FOR BIGGER JOBS!
Gives you extra capacity for portable drilling — $\frac{1}{2}$ " diam. in steel, $\frac{1}{8}$ " diam. in hardwood. Hole Saws available up to 3" diam. Makes powerful bench drill press when mounted in HOME-UTILITY Bench Stand (\$17.45).

H-U $\frac{1}{2}$ " ELECTRIC DRILL \$35.95



HANDY DRILL KIT PACKED WITH USES!
One price gives you H-U $\frac{1}{4}$ " Drill; horizontal stand; 13 high-speed twist drills; grinding, buffing and wire brushing attachments — all in a sturdy metal carrying kit.

H-U $\frac{1}{4}$ " ELECTRIC DRILL KIT \$39.95



REVOLUTIONARY SANDING ATTACHMENT! Ideal for sanding picture molding, hobby parts, sharpening edged tools, etc. Fits H-U Sander-Polisher or H-U $\frac{1}{4}$ " Drill. Attaches to horizontal stand (\$3.35 extra). Gives you sanding table, metal plate, mitre gage, 3 discs, disc cement.

H-U DISC SANDING TABLE \$8.25

YOU CAN DO THOUSANDS OF JOBS LIKE THESE WITH HOME-UTILITY TOOLS



DRILL IN ALL MATERIALS



WAXING FURNITURE



REMOVING OLD PAINT



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SAWING STAIR STRINGERS

FOR HOMES • FARMS • SHOPS • TOOL KITS

ELECTRIC
HOME-UTILITY
TOOLS

Products of The BLACK & DECKER Mfg. Co.

Send for this new, useful
HOW-TO-DO-IT Booklet—FREE!

HOME-UTILITY ELECTRIC TOOLS
The Black & Decker Mfg. Co.,
Dept. H12M, Towson 4, Md.



Gentlemen: Please send me your free booklet on speeding up odd jobs.

NAME.....

ADDRESS.....

CITY..... ZONE..... STATE.....

Among the rare species caught recently is the famous ribbonfish, a long snakelike creature, often mistaken by landlubbers for a "sea serpent." The eggs of this fish, about the size of a grain of rice, were caught in the fine-meshed sardine nets.

Another oddity is the rare medusafish which lives in the internal cavity of the medusa or jellyfish—like a baby kangaroo in its mother's pouch—where it is protected from larger fish that dare not approach the jellyfish and its stinging nettles.

In the shops of the Scripps Institution, many new kinds of equipment have been devised for the scientific fishermen by the special-developments division. Among

them are a shallow-water camera that uses stroboscopic light, a plankton net, enclosed in a steel tube, which can pulled through the water at 15 knots, many times faster than any previous net. Another unusual development is a tiny maximum-depth meter which is inserted in fish to record the greatest depths they reach.

One of the most valuable tools in the sardine project—and one which may have tremendous commercial possibilities—is sonar. This device, developed by the Navy for detecting submarines, is a kind of underwater radar using sound waves instead of electrical impulses.

(Continued to page 264)

The Ideal Christmas Gift DREMEL Electric MOTO-TOOL

The "Pocket Size
Machine Shop"

Grinds, Routs, Drills,
Cavels, Engraves,
Cleans, Polishes,
Finishes

APPROX.
27,000
R.P.M.

MOTO-TOOL NO. 2
with one emery wheel point
\$16.50

MOTO-TOOL KIT NO. 2
With 23 Accessories
(High-Speed Steel Cutters,
Grinding Wheels,
Polishing Accessories)
\$23.50

Great for
Hobbyists
Saves Time
and Labor

10 REASONS WHY MOTO- TOOL IS A BETTER BUY

Here's what you get in a Dremel No. 2 Moto-Tool: Oil-less, sealed bearings • Patented automatic chuck lock pin • Oversize armature shaft, hardened, ground, polished • Shockproof, bakelite housing • Dust filtered air cooling system • Dynamically balanced armature (for vibrationless operation) • Exclusive hanger hook • Sturdy 110-120 Volt AC-DC motor • Weight only 13 oz. • Cutters in Kit No. 2 are made of high speed steel (not common high carbon steel) for longer life, faster cutting.

Moto-Tools, Kits and Accessories should not be confused with "bargain offers." We invite you to compare Dremel Products feature for feature with other similar equipment. If you are not fully convinced ours are far superior in quality, design and performance, we don't want you to buy.

WIDELY USED IN INDUSTRY — Moto-Tool is a precision-built electric tool, backed by over 13 years of industrial use in such plants as: GENERAL ELECTRIC • FORD • REMINGTON ARMS • NASH-KELVINATOR • WESTINGHOUSE • DOUGLAS AIRCRAFT, etc.

PRE-WAR PRICES STILL PREVAIL

MOTO-TOOL KIT NO. 2 with 23 accessories including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case.....

\$23.50

MOTO-TOOL NO. 2 with one emery wheel point.....

\$16.50

WHERE TO BUY — Buy Moto-Tool from your dealer. If he cannot supply you, send check or M. O. for items desired and we will ship postpaid. Or, send only \$2 now and pay postman balance plus postage on delivery. **MONEY-BACK** if not delighted after 5 days' trial. Catalog of Dremel Tools **FREE**.

Portable DRILL PRESS

Add all-around versatility to your Moto-Tool with this 12" high drill press. Just the thing for creating costume jewelry, model making, carving, routing, drilling, etc. Utilizes No. 2 Moto-Tool, which can be raised, lowered or swung in any direction. Weights 3½ lbs.

Only \$9.95
(Less Moto-Tool)



BIG VALUE!



MODEL NO. 1

MOTO-TOOL KIT
Only \$17.50

Moto-Tool Kit No. 1 contains the lighter Model No. 1 Moto-Tool and 34 practical accessories (steel cutters, grinding wheels, etc.) in an attractive, lacquer-finish wood case. It's the biggest bargain **\$17.50** in the field.....

MOTO-TOOL NO. 1 with one emery wheel point... \$9.85

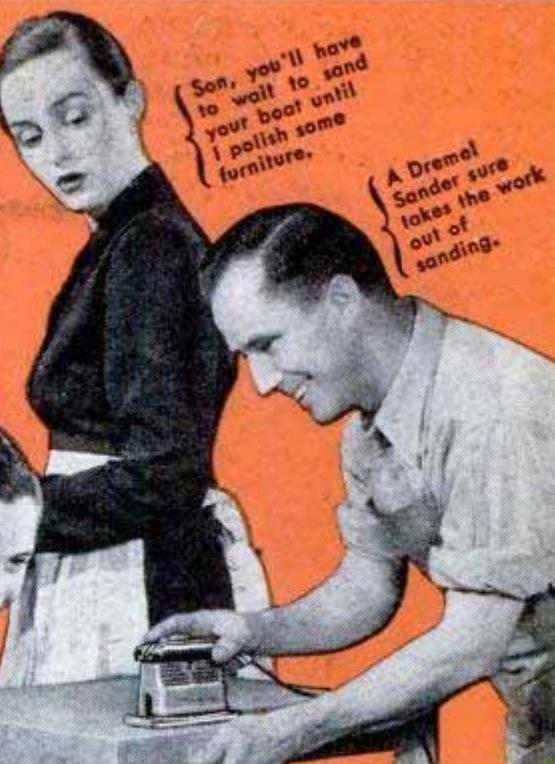
DREMEL MFG. CO., Dept. T119-M, Racine, Wis.

A Gift the Whole Family Can Use
THREE TOOLS IN ONE



Only
\$14.85

POSTPAID



{ Son, you'll have
to wait to sand
your boat until
I polish some
furniture.

{ A Dremel
Sander sure
takes the work
out of
sanding.

DREMEL *Electric* SANDER

Popular Labor Saver for the
HOME and SHOP

FUN FOR BOYS FROM 8 TO 80

DREMEL *Electric* COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS



SAFE!
AS A
HANDSAW

For men who harbor a hobby or do their own repair work . . . for boys who like to make things . . . no other tool will give as much pleasure and satisfaction in the home or workshop for the small amount of money invested as a Dremel Electric Coping Saw. It works in any direction . . . delivers 7,200 strokes per minute . . . so easily, there is no effort . . . so smoothly, work needs no sanding. Makes child's play of tricky scroll designs . . . saws through 3/4" medium hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Saw has only two moving parts . . . never needs oiling. Operates on AC current. Thousands and thousands of satisfied users.

WHERE TO BUY IT—Buy Dremel Electric Coping Saw from your dealer. If he cannot supply you, use the coupon to order direct from factory. We ship postpaid if you send check or money order in full. Or, send \$2 now and pay postman balance plus postage, on delivery. Money back if not delighted after 5 days' trial.

DREMEL MFG. CO. • Dept. S119-M • Racine, Wis.



Plan for making six useful decorative projects packed with each Dremel Electric Coping Saw.



MAKES PLAY OF
WAX POLISHING



SOOTHES TIRED MUSCLES
BY MASSAGE

The popular Dremel Electric Sander is more than a sander . . . it's also a polisher and massager. This miracle machine is so easy to handle, a child can use it. It delivers 14,400 strokes per minute. (1) As a sander, it gets into tight corners, takes the effort out of sanding walls, woodwork, furniture, workshop projects, etc. Its straightline (non-rotary) action will not burn or scratch surfaces. (2) As a polisher, it does a professional job on waxed surfaces of cars, furniture, refrigerator cabinets, etc. (3) As a massager, it's ideal for tired or sore muscles of the back, legs or arms. Users testify it is more effective than machines made expressly for this purpose.

LOOK AT THESE DREMEL FEATURES

Dremel Electric Sander does all the work . . . you merely guide it. It weighs only 2 1/2 lbs.; it's foolproof (has only two moving parts . . . never needs oiling). Quick-change clamps firmly hold abrasives and pads. Dremel Sander is sturdily built to give long, trouble-free service. Operates on 110-120 Volt, 60 Cycle, AC. Thousands and thousands of satisfied users prove its outstanding value.

WHERE TO BUY IT — Dremel Electric Sander comes complete with 6 sheets assorted grade Garnet Paper for sanding, plus felt pad and sheepskin for polishing. Buy it from your dealer. If he cannot supply you, use coupon below to order direct from factory. We ship postpaid if you send check or money order in full. Or, send \$2 now and pay postman balance plus postage, on delivery. Money back if not delighted after 5 days' trial.

**If Your Dealer Cannot Supply You
USE THIS HANDY COUPON ORDER FORM**

DREMEL MFG. CO. • Dept. S119-M • Racine, Wisconsin

- Enclosed find \$_____ (Check or M. O.) in full payment for items checked below. Ship postpaid at once.
- Enclosed find \$2.00 in part payment for items checked below. I agree to pay postman balance plus postage, on delivery.
- Dremel Electric Sander \$14.85 Dremel Electric Coping Saw \$5.85
- Free catalog of Dremel Electric Tools.

Name _____

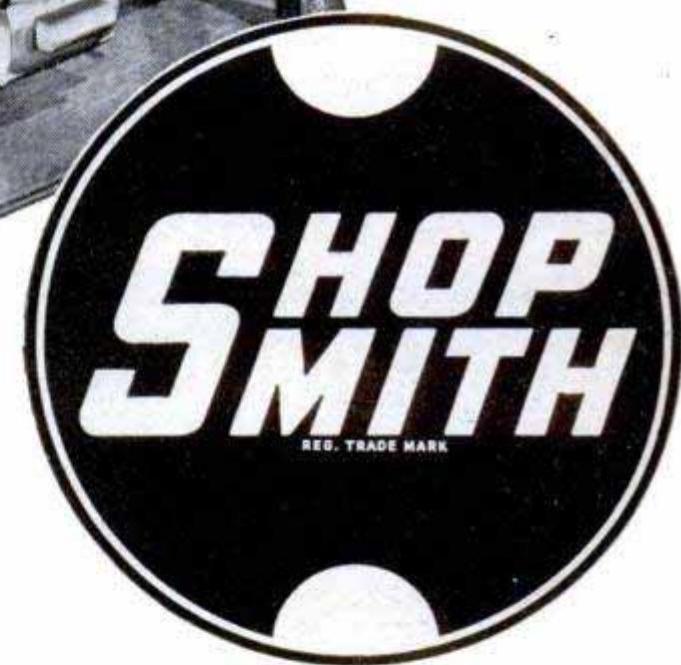
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ONLY \$199.50 FOR A COMPLETE POWER WORKSHOP



*Your complete
power workshop in
just 18" x 60" floor space.
With $\frac{1}{2}$ -hp. ball-bearing
motor illustrated, \$199.50.*



For less than \$200—and with eight square feet of floor space—you can have a power shop second to none in capacity, accuracy and flexibility. It's SHOPSMITH—five heavy-duty, extra-feature tools in one unit so beautifully engineered, so ingeniously designed that you can convert from tool to tool in less than 60 seconds.

NEVER BEFORE SUCH AMAZING CAPACITY

Imagine a circular saw that cuts to center of 8' plywood panels . . . a lathe that takes work up to 15 inches in diameter . . . a drill press that mortises doors and panels as easily as it drills miniature parts . . . a disc sander that squares, miters and

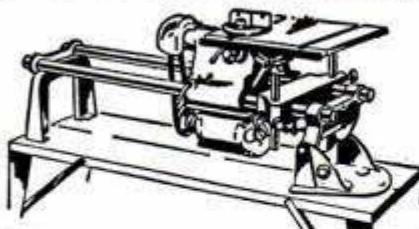
finishes with "try square" accuracy. You get these, and more, with SHOPSMITH.

OUTPERFORMS SINGLE-PURPOSE TOOLS

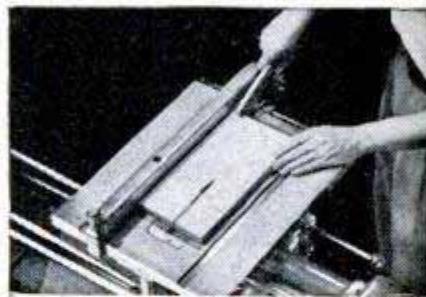
Compare SHOPSMITH with any combination of single tools at any price. Compare it for accuracy, capacity, all-round utility. You'll see why the thousands of men who own SHOPSMITH praise it so enthusiastically. On display at any Montgomery Ward store and at leading hardware or department stores. SHOPSMITH, complete with attachments, costs \$169.50. With heavy-duty $\frac{1}{2}$ -hp. ball-bearing motor, \$199.50.

5 RUGGED POWER TOOLS IN 1

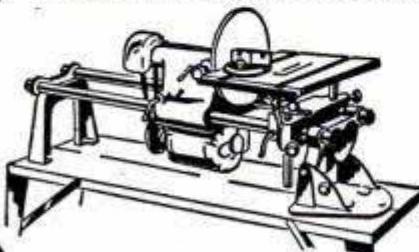
1 EIGHT-INCH CIRCULAR SAW



Effective table width up to 56". Maximum depth of cut, 2 1/4". Machined tilting table, ribbed for extra strength. Precision-tooled rip fence and miter gauge. Unique micro-adjustment permits extremely accurate ripping.



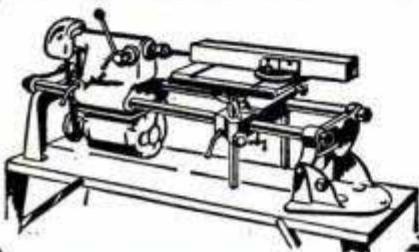
2 TWELVE-INCH DISC SANDER



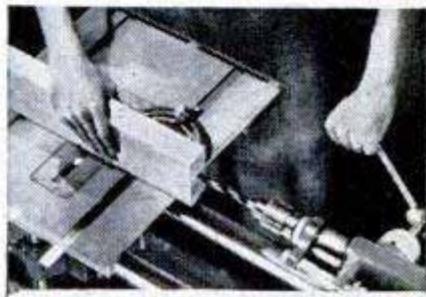
Cast-aluminum disc easy to attach and remove. Extra-large, adjustable table measures 14 1/2" x 17". Miter gauge and rip fence can be used for accurate squaring and jointing. Has features found in no other disc sander.



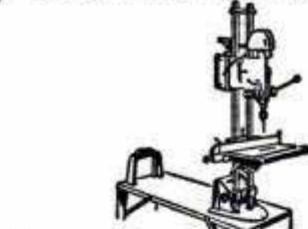
3 HORIZONTAL DRILL PRESS



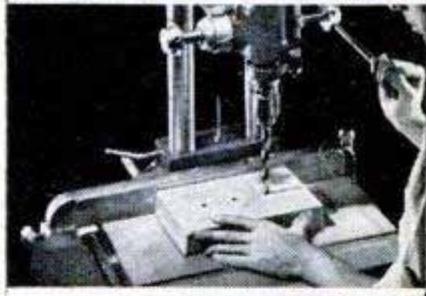
Extremely useful operation possible only with SHOPSIMTH. 4" quill feed, automatic stops. Permits large, heavy pieces to be drilled or mortised quickly and accurately. Eliminates need for jigs. Length of work limited only by size of room.



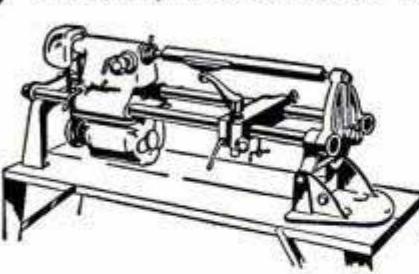
4 VERTICAL DRILL PRESS



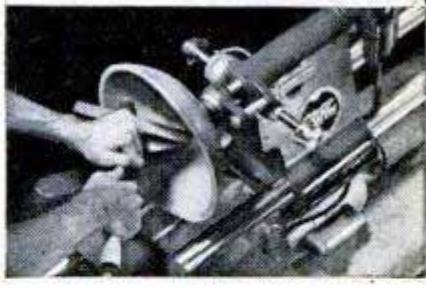
SHOPSIMTH drills to the center of a 15" circle, has a maximum clearance table to chuck of 27". Jacobs key chuck takes drills from 5/64" to 1/2" diameter. Rugged, six-spline spindle with 4" feed. Variable speeds 875 to 3500 rpm.



5 THIRTY-THREE-INCH WOOD LATHE



With a 15" swing, SHOPSIMTH has greater capacity than most other heavy-duty lathes. Distance between centers, 33". Swivel-arm tool rest always slides parallel to ways—no need for constant adjusting. Has 4" quill feed. Quickly adaptable for oversized faceplate work.



AND THAT'S NOT ALL! WE'VE MORE TO TELL YOU, BUT NO MORE SPACE TO TELL IT HERE. IT'S ALL COVERED IN AN ATTRACTIVE, ILLUSTRATED BOOKLET. WRITE FOR YOUR FREE COPY TODAY!

Address SHOPSIMTH, Dept. 105-B,
at factory nearest you.
12819 Coit Rd., Cleveland 8, Ohio, OR
417 Montgomery St., San Francisco, Calif.

I'm interested in SHOPSIMTH. Please
send me a free copy of the descriptive
booklet. And tell me where I can see
SHOPSIMTH demonstrated.

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BUILD ELECTRIC CLOCKS

...of
your own
design...

with

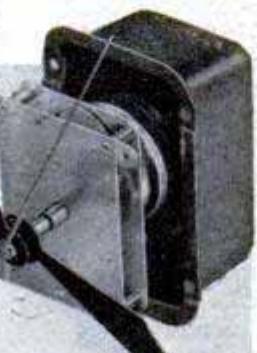
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TRADE MARK
... for Profit!

Ideal for
BUILT-IN
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Kitchens



Movement 3" x 4 1/2" x 2" deep

**POWERFUL GUARANTEED
MOVEMENT FOR 3" TO 36"
DIAL CLOCKS**

BUILD ELECTRIC CLOCKS for homes, offices, dens or club rooms in natural woods, plastics, metal or other materials. Make modern and novelty clocks for profit!

QUIET LIFETIME ELECTRIC MOVEMENT is shielded against moisture and dust. Has sweep second hand shaft . . . self starting . . . not a toy! Highest quality precision construction resists wear indefinitely. NEVER NEEDS OILING! Guaranteed for one full year.

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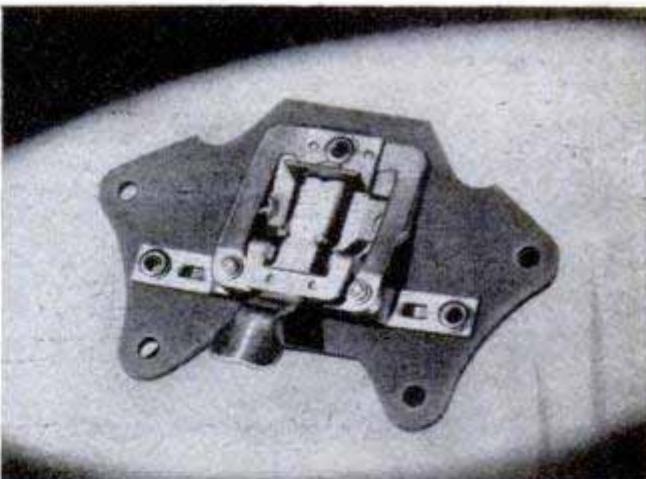
405 South Wabasha • St. Paul 7, Minnesota

At present, sardine fishing is restricted to the dark of the moon because schools can only be detected at a distance of 100 yards by the phosphorescence of their scales. By means of sonar echoes, however, it might become possible to discover schools of sardines 1000 yards away. Nets could then be lowered in the daytime as well as at night.

During the war, University of California scientists working for the Navy found that they got mysterious sonar echoes in the daytime from depths of 500 to 1000 feet. They called the layer the "deep scattering layer."

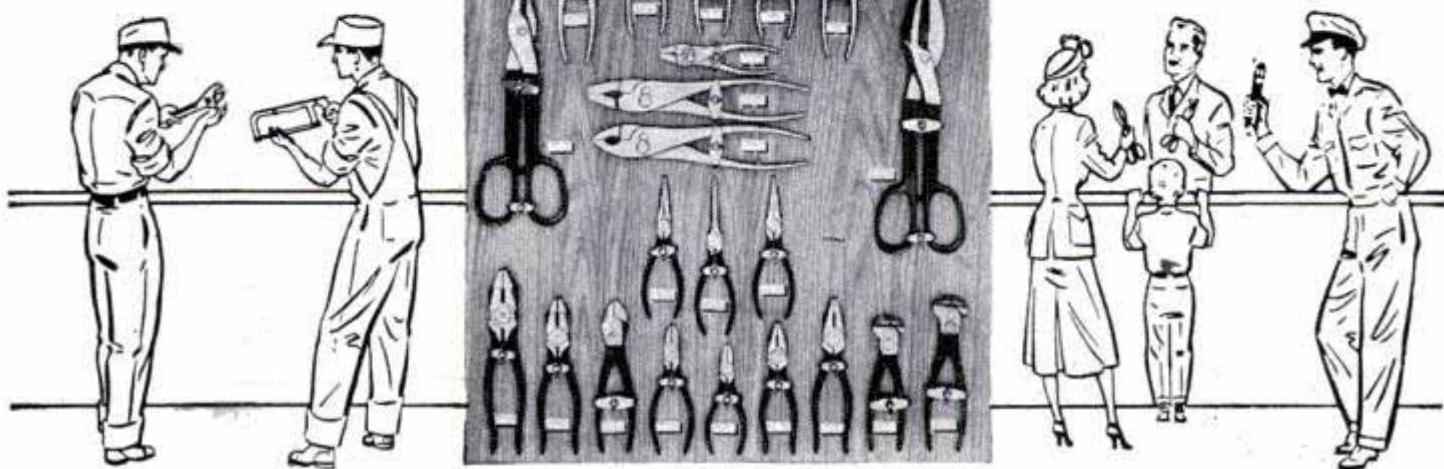
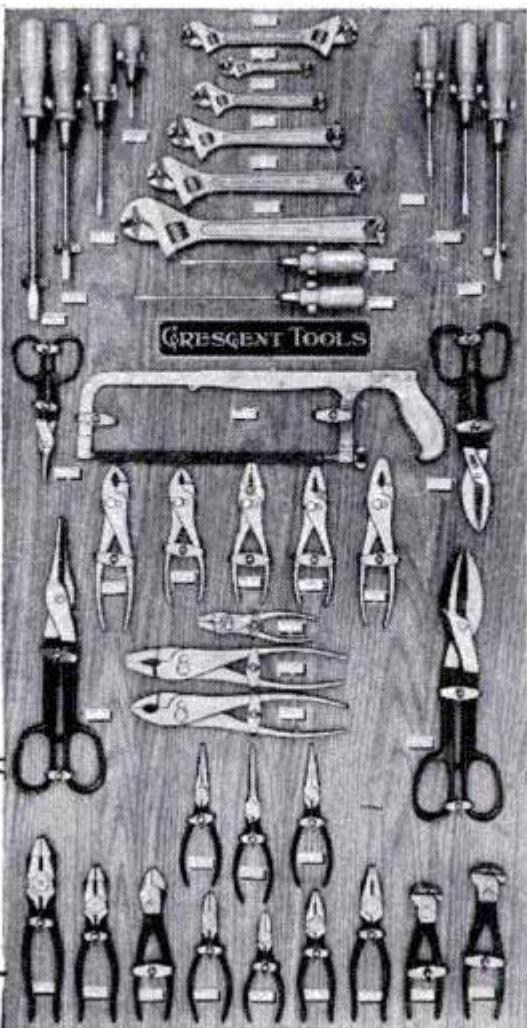
At night, the layer rose to the surface and became more diffuse. Later it was determined that the sound was reflected back to the sonar ship by marine animals. Studies are now being made to find out if these animals are tiny plankton, larger fish or even giant squid which may compete with the sardines for food. Investigations of this mystery of the deep were explained in a feature article entitled "Deep-Sea Mystery Story," which appeared in the September 1949 issue of *Popular Mechanics*.

With these scientists working on the problem, using skills and equipment that would make Sherlock Holmes envious, we may someday know the solution to the case of the vanishing sardine!



Reversing Switch For Single-Phase Motor

Single-phase electric motors now can be reversed instantly with a simple switch that replaces the starting switch and is held in place by the same mounting screws. Its action is mechanical, being similar to conventional starting switches except that it has two contacts instead of one. The contact which is closed determines the polarity of the auxiliary winding field and the direction of rotation. An external control switch directs passage of the current through the internal reversing switch.



BUY TOOLS WITH CONFIDENCE WHERE YOU SEE THIS DISPLAY

Crescent not only manufactures Hand Tools of Good Design and Outstanding Performance, but Crescent Dealers make it easy for you to select and purchase them.

About 30,000 Hardware Dealers throughout the country stock Crescent Tools. Almost 3,000 of these dealers

display them on Tool Panels, like the one illustrated above, which make it easy for the purchaser to select the size and type best suited to his needs.

When you need Hand Tools and if you want the best for your dollar, go to your Hardware Dealer and ask for the "Crescent" or "Crestloy" Brand.

**EVERYBODY
RECOGNIZES
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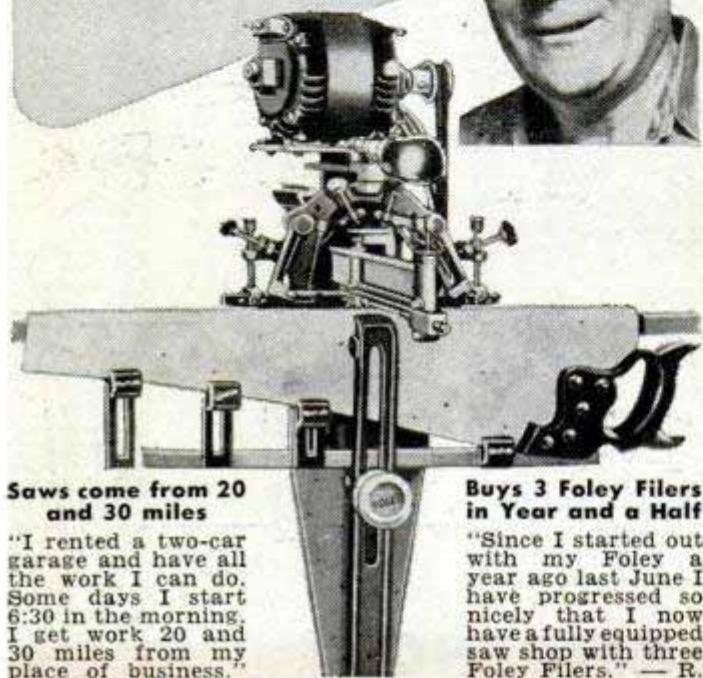


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Your Own Business

FILING SAWS



Saws come from 20
and 30 miles

"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business."

—Charles H. Smith.

Buy 3 Foley Filers
in Year and a Half

"Since I started out with my Foley a year ago last June I have progressed so nicely that I now have a fully equipped saw shop with three Foley Filers." — R. W. Persinke.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings you more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and cross-cut circular saws on the Foley Saw Filer. The adjustments are simple — there is no eyestrain — and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Filer came out 100%. I think it is a marvel of perfection." — writes Clarence E. Parsons.

FREE BOOK Shows How to Start

"INDEPENDENCE AFTER 40"
explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think — with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Start now — you can get IMMEDIATE DELIVERY on a Foley Saw Filer.



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Minneapolis 18, Minn.

Send me free book "INDEPENDENCE AFTER 40!"

Name _____

Address _____

Santa Claus Lives in Pittsburgh

(Continued from page 108)

and beneath, the first. A viewing frame, set at the top platform level, held the Chinese mirror at an inward slant. It acted as a window for the upper dioramas and reflected those below. Hence, as different dioramas were moved into position, they overlapped the one already in the frame until the latter was moved away on its belt. "Of course," Seibel points out, "the mirror reflected the bottom ones in reverse, so it took some careful figuring. Now we can truthfully say that we can even build things backwards."

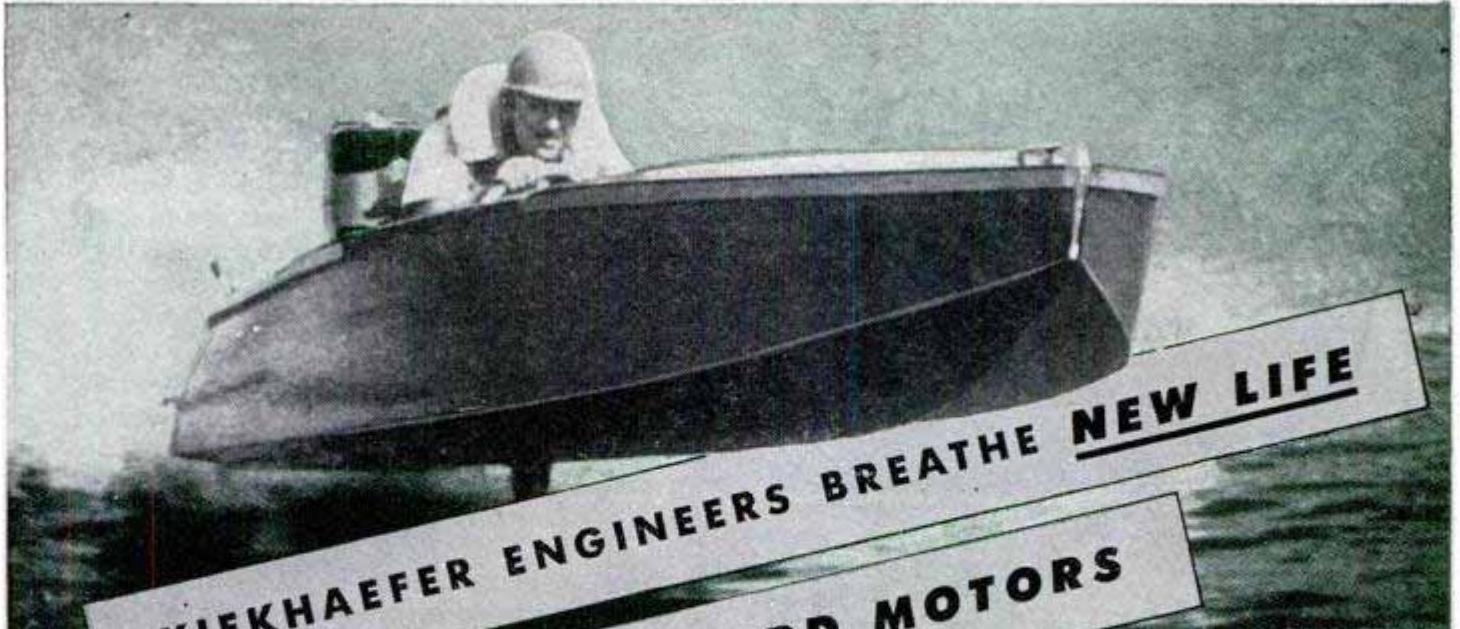
Nobody knows when the firm branched from sign painting to more elaborate displays, but Chicago's Century of Progress (1933-34) saw them well represented. Today, you can hardly visit a fair without seeing something from the shop. Literally thousands of animated displays have come from its lathes and bandsaws. Two of its full-scale houses, complete with furnishings and appliances, toured the country for the FHA in five freight cars. Sixty-seven Gardner creations adorned the New York World's Fair, including an elaborate thing designed by Salvatore Dali, called the "Dream of Venus." It consisted of a huge water tank, in which swam fish, live mermaids with rubber tails and a rubber piano.

During the war, the busy shops turned out full-size airplane training mockups for the Army. There were pilot-training cockpits for instrument practice, cutaway machine guns and a full-size ditching mockup of a B-17 bomber, which slid down a track into a Florida lagoon hundreds of times. Full crews were aboard. At first it took them 10 minutes to escape; later they did it in 40 seconds.

As soon as the war ended, Gardner got back into its old stride, turning out impossible displays for anyone. An order came in not long ago for a full-scale diesel engine with three freight cars and a caboose. Seibel was told to deliver in 10 days. Gardner has never missed a deadline, and Jim had no intention of spoiling the record. "We started building that thing without plans," he says. "Just laid out a framework and went to work with wallboard, wire, plaster and aluminum sheeting."

By the time the plans were ready, the train was half finished. Rails and ties were carved out of wood—in perspective. Homosote was used to represent the gravel between the ties. "We made that one with time to spare," Seibel recalls. "The headlight glared, its horn blew and I hear it attracted a lot of attention."

(Continued to page 268)



KIEKHAEFER ENGINEERS BREATHE NEW LIFE
INTO BIG OUTBOARD MOTORS

Even More Performance per horsepower! Now More Performance per pound of weight! . . . THE SENSATIONAL NEW 1950

KIEKHAEFER **MERCURY**

25 H.P. Thunderbolt

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The BINKLEY "rota-matic" SANDER eliminates all the old "back-breaking" home methods of sanding. For instance, you can sand down a table top in $\frac{1}{2}$ to $\frac{3}{4}$ the time ordinarily required.

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"rota-matic" sanding disks outwear ordinary sandpaper sheets 20 to 30 times because they rotate, putting each cutting face of the sanding grit to work. This same rotating action makes the disk self-cleaning and even-wearing. Sturdily built of steel—no complicated parts to wear out!

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BINKLEY MFG. CO., Desk M-1, Warrenton, Mo.



FLAT SURFACE



BEVEL EDGES



ROUND CORNERS

Seibel is always dreaming up odd materials to achieve the effects he wants. Arms and legs on many big figures are made with steel rods, jointed and levered if the parts are to move, then capped with papier-mache for contour. But papier-mache is expensive, so today you'll see huge cartons of cardboard rolls, like the kind they roll oilcloth around, sitting in the Gardner warehouse. They're stronger and cheaper.

Wigs give Seibel a bad time. They're expensive and it's tough getting just the right quality. For a ventriloquist unit, he walked the streets for days, prowling through furrier shops. Finally, he saw what he wanted—a gorgeous piece of Persian lamb, just the right shade. Before the eyes of horrified furriers, he slashed off what he wanted, paid \$40 for the skin, threw the scraps back on the counter and walked out of the shop. "It was just right," he said. "We made our own wigs."

The 12-foot "Alice in Dairyland" required \$350 worth of hair, bought from an Italian wigmaker. "We had it waved and set," he says, "but by the time Alice got to the fair, that hair was so heavy it drooped straight as a poker. We had to do it over continually."

Perhaps the toughest job that ever hit the Gardner workshop was one that came in this year. A railroad company wanted a figure of Paul Bunyan 23 feet high; he was to move his hands, turn his head, roll his eyes and talk like a he-man. All last summer that monster of a figure sat on display at the Chicago Railroad Fair, doing all the things it was supposed to do.

Under ordinary procedure, Seibel would draw a rough sketch and turn it over to the art department for detailed plans of each part. On Bunyan, there just wasn't time. Seibel went out and got reams of wrapping paper, spread it out on the floor and went to work with a big crayon, drawing a full-scale sketch of what he needed. Then he stuck the paper together with tape and hung it from the highest rafter. It was 23 feet high. Bunyan progressed like all masterpieces—bit by bit. They tried nails for his mustache, but gave that up when they rusted. Wire brushes retarded movement of his mouth when he talked. Finally, they just painted on the whiskers.

The massive head was built along standard Santa Claus lines, with wire caging formed over the skeleton. The head was then modeled in clay, a plaster-cast mold made from it, and then cast in papier-mache. Over this was pulled a skin of foam rubber $\frac{1}{8}$ -inch thick.

The eyes had to be sealed to prevent rain from getting in and gumming up the works.

(Continued to page 270)

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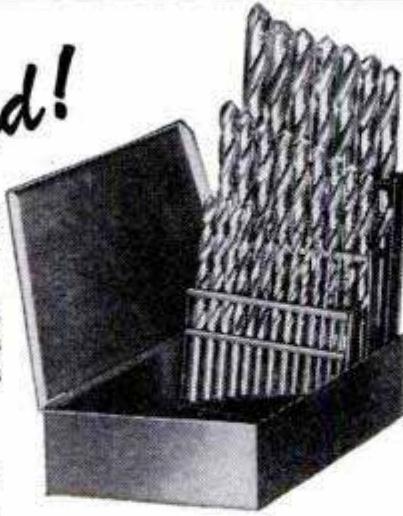
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So the plastic shop blew nine-inch plastic bubbles and sealed them into the rubber. Another, smaller set, fitted inside them. These were the actual eyes, attached to the hinged crossarm that turned them back and forth.

Fourteen waterproofed double blankets made Paul Bunyan's shirt, with balsa-wood buttons the size of pie plates. Two tar-paulins, 30 by 60 feet each, were just enough for the pants. Two hanks of horse-hair made his wig. His hands, six feet long, and his nine-foot boots, were made of papier-mâché, from plaster casts. Coat after coat of varnish went over these exposed parts until they were thoroughly waterproofed. Miles of wiring hooked up a pair of pick-up microphones at audience-head height—down near Bunyan's feet—to the hidden operator's booth, where questions from the audience were heard and answered. As in the talking Santas, the operator could answer the questions. The sound impulses traveled up under Bunyan's shirt to a pair of auditorium speakers capable of sending his voice booming for three miles, and at each syllable, his gigantic mouth would open and close in proper "synch." His hands and arms, hinged and belted in true anatomical fashion, raised and lowered under power from several electric motors, activated by buttons in the operator's booth. His monstrous head swung from side to side, and so did his eyes.

Seibel, Hill and the huge collection of imaginative craftsmen at Gardner are back in the Santa Claus business right now. They've built a new unit this year—"the Jalopy." It's a half-scale lizzie with Santa driving, gnomes scattered around pumping tires, throwing gimmicks in the engine and raising Cain in general. The simple plywood affair has fenders hung on springs. Everything on it is loose, including the wheels. Through slots in its platform, the wheels contact big eccentric cams which are turned by electric drive. These send the jalopy into the biggest cavort you ever saw. Fenders flop, things heave, the gnomes dance around like little devils and Santa sits cheerily smiling and waving his free arm at all and sundry. A dozen of them have come off the assembly line so far. It's not a big display, but it's effective and a lot of kids will get a bang out of it.

"There was a big one I'm glad we didn't get," says Jim Seibel. "A large department store wanted a Statue of Liberty, almost full scale. It was to sit on their marquee and stretch up 10 stories in the air. They gave up the idea." Then he gets a far-away look in his eye. "We could have done it, of course—it would have been a whopper."



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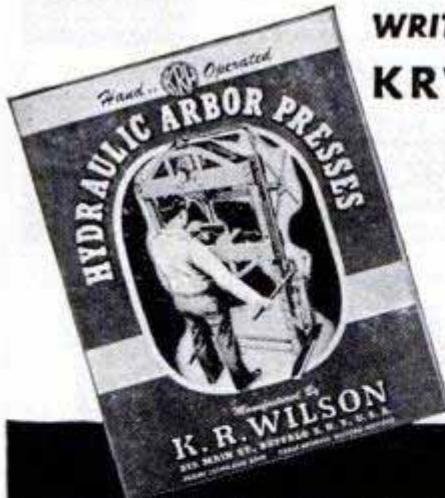
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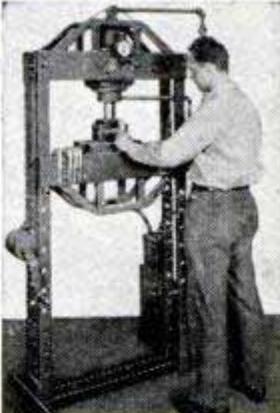
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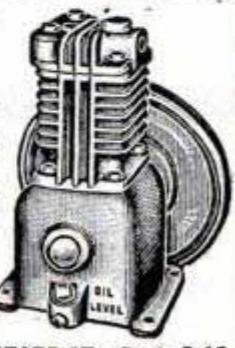
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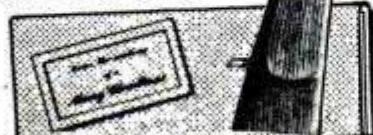
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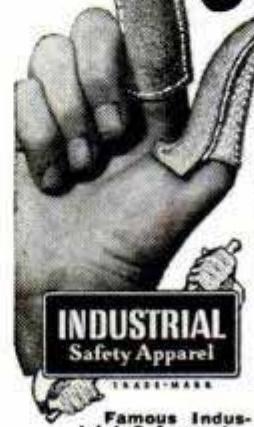
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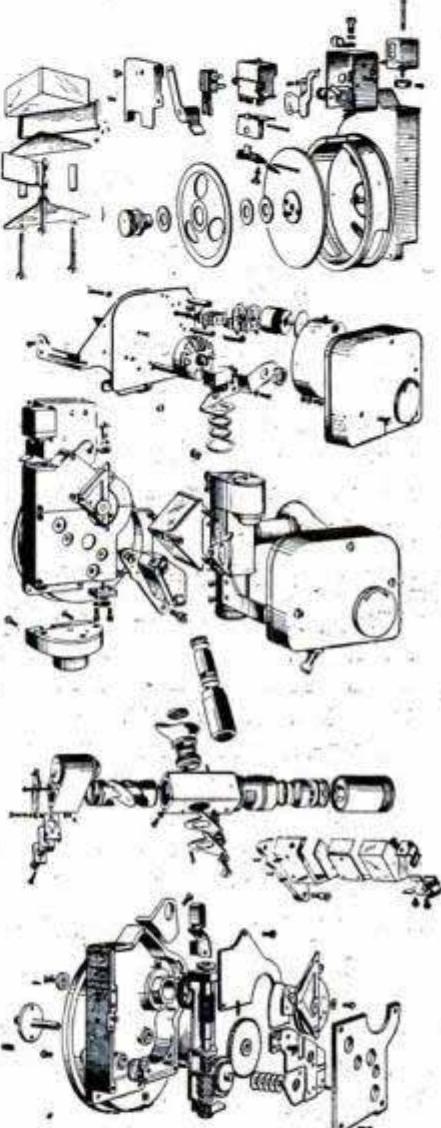
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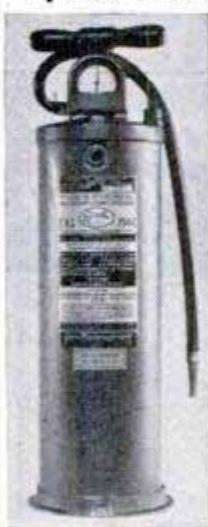
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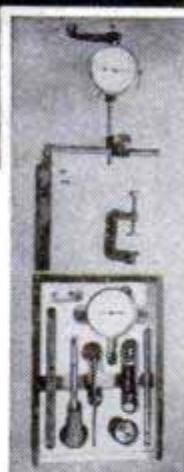
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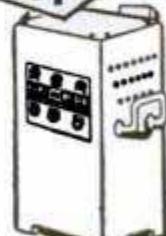
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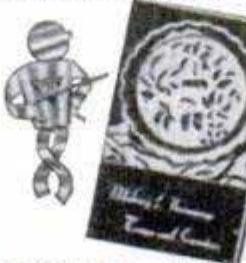
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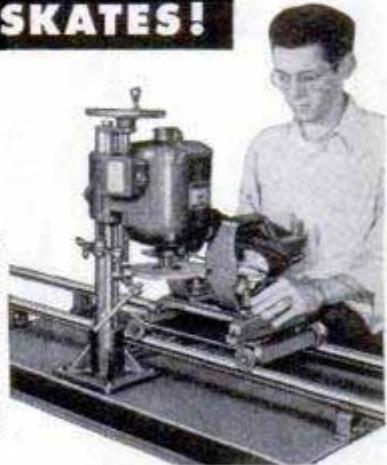
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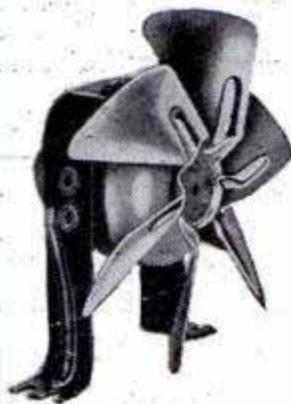
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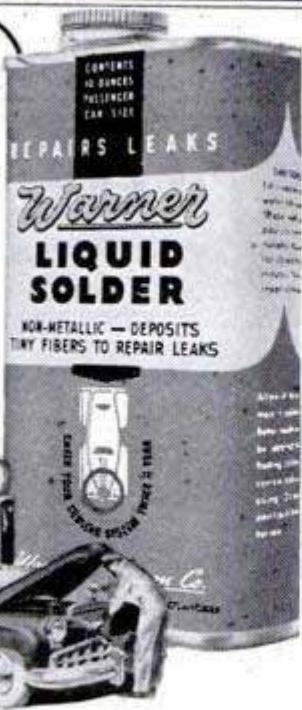
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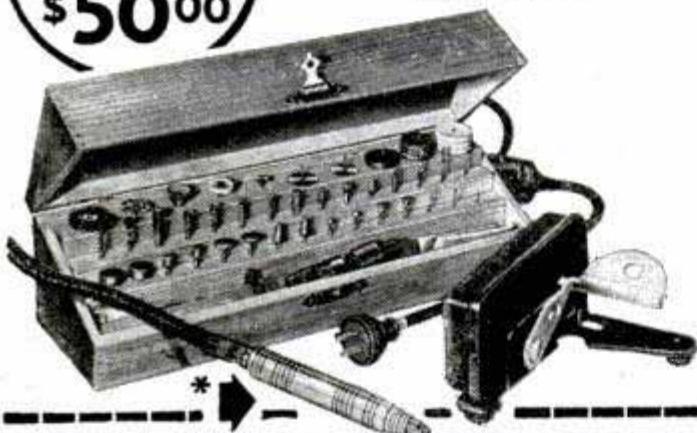


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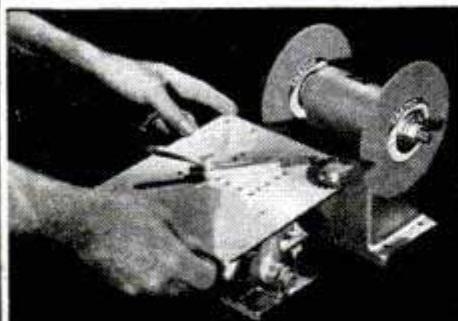
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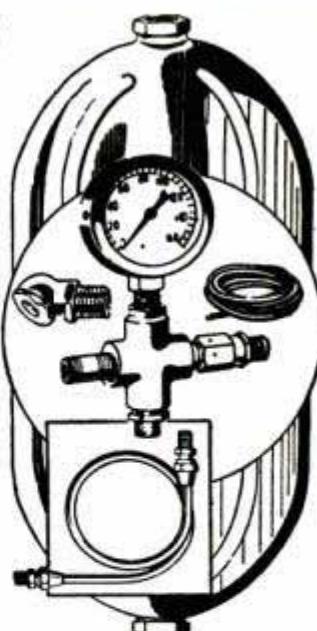
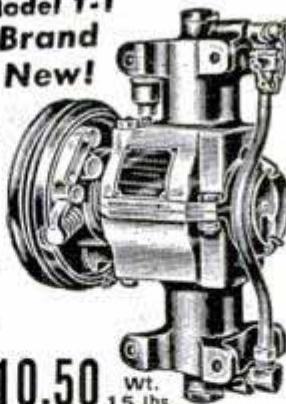
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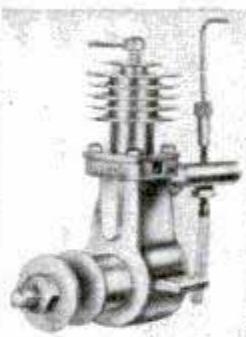
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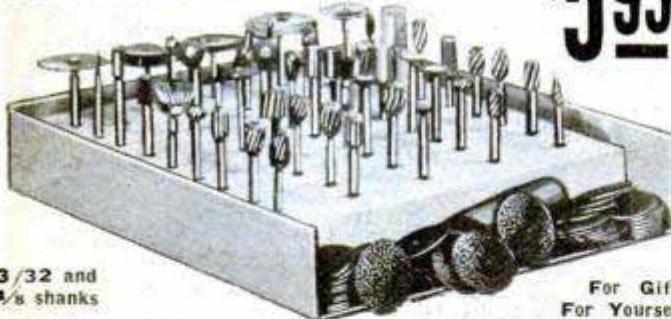
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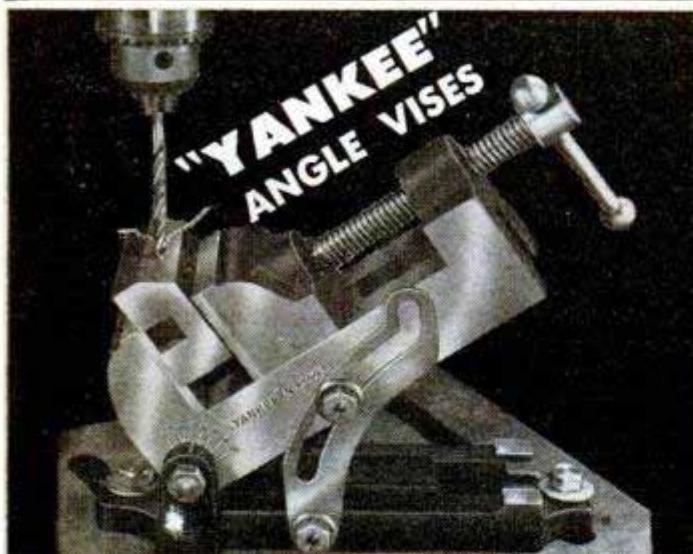
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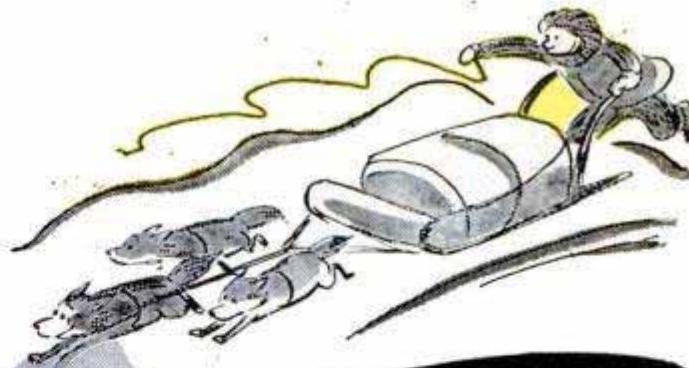
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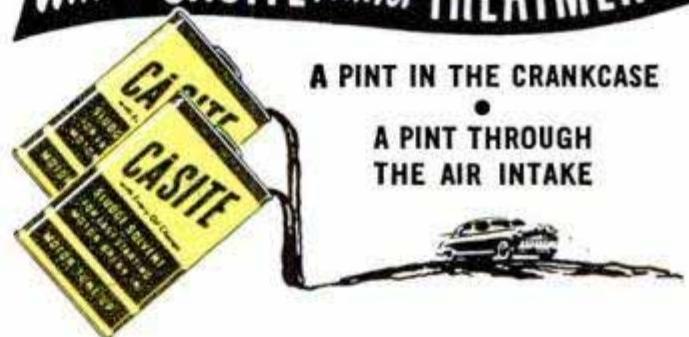
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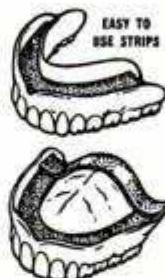
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If your plates slip or hurt, rock and cause sore gums...you need Brimms Plasti-Liner. Easy to use. Gives instant comfort. Hardens to plates permanently. Lets you eat anything, talk freely without embarrassment. Even on old rubber plates gives good results six months to a year or longer. Ends forever mess and bother of temporary stickums. Tasteless, odorless, harmless to you and your plates. Removable as per directions. *Guaranteed satisfaction or your money back.*

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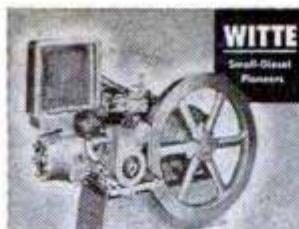
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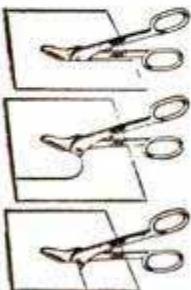
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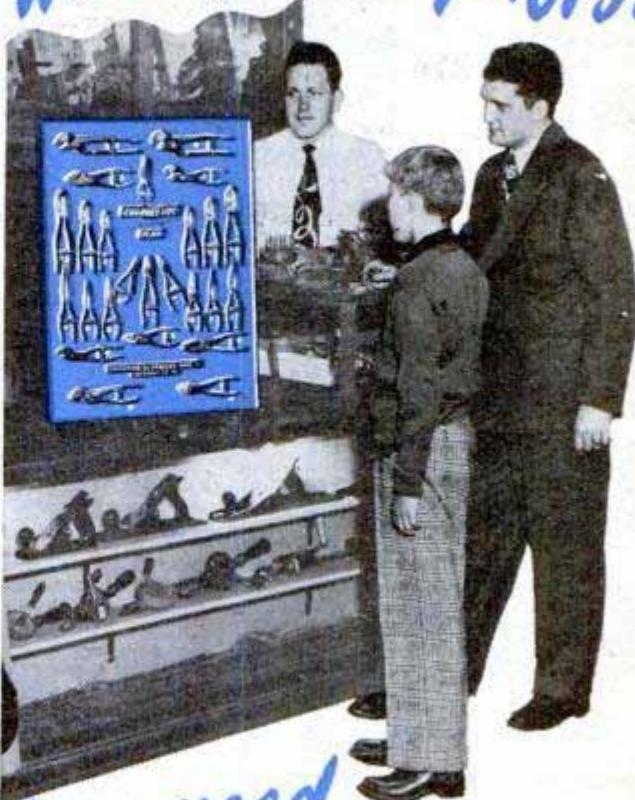
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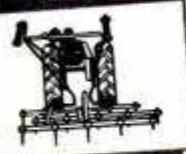


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GARDEN TRACTORS

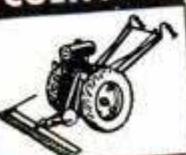
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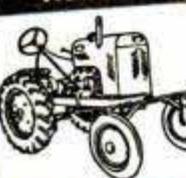
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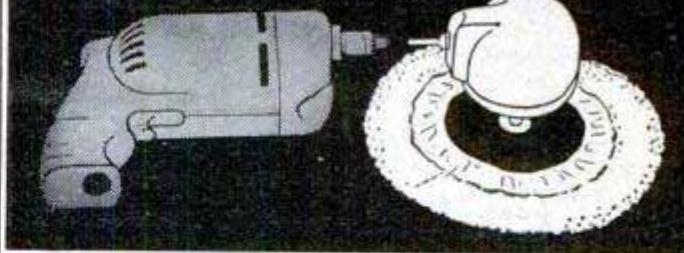
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(For use with Bull Buffer only)

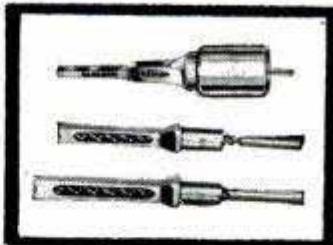
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5" aluminum oxide production sanding discs 0000-00-0-1-21/2"	
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AND WATCH THE CHIPS FLY!**



Now you can mortise on-the-job, now you can rout on-the-spot with the new Bull Mortising Adapter! This amazing new adapter can be attached in either drill or drill press in a matter of seconds, and it gives you a powerful, portable tool that really makes the chips fly!

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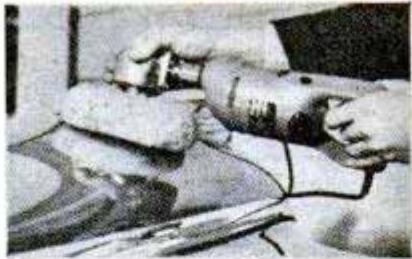
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1/4" ELECTRIC DRILL

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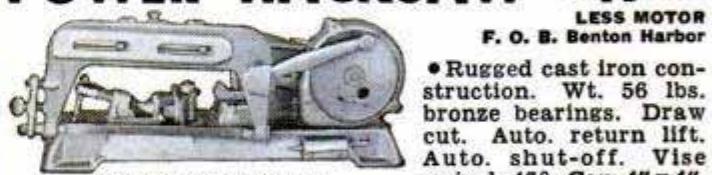
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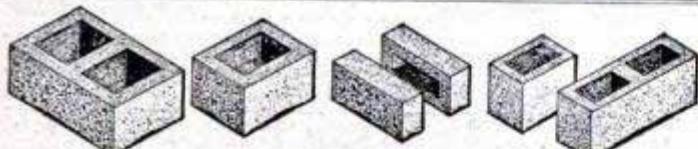
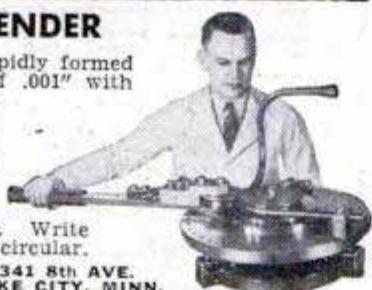
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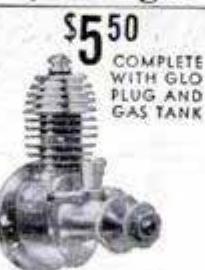
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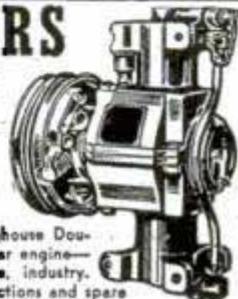
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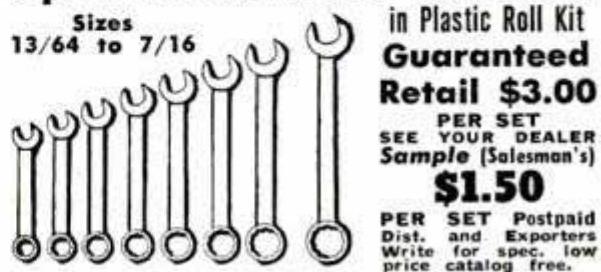
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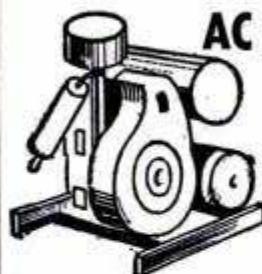
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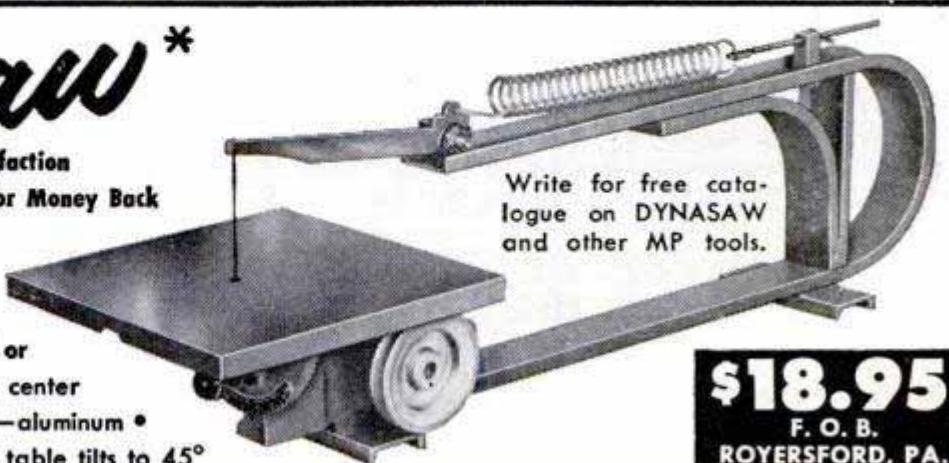
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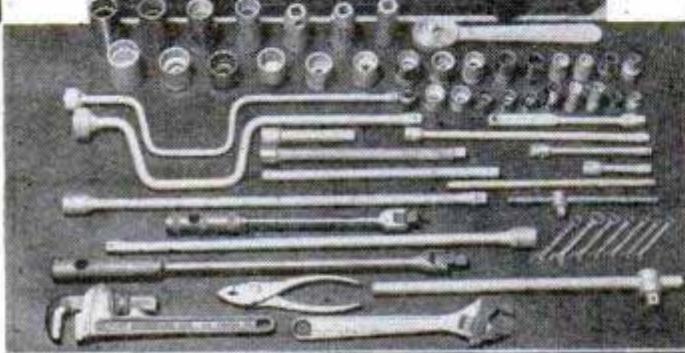
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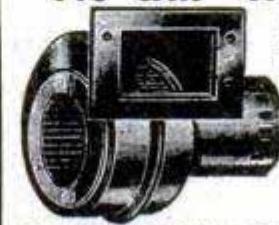
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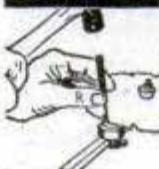
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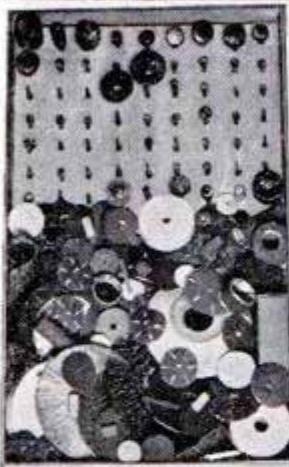
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MILLING ATTACHMENT

3 SIZES

No. 250 Illustrated

2½" JAW Only \$24.75

CONVERT LATHE IN 10 SECONDS

Now you can Mill, Slot, Grind, Groove, Square Shafts, Saw at Angles, Recess and many other important jobs. SAVE TIME and MONEY! Why send work out or use costly methods when a PALMGREN MILLING ATTACHMENT will solve your problem.

Precision built, it has accurate graduations for rotary angle adjustments, also graduated vertical feed screw. Fits South Bend, Atlas, Craftsman, Logan, Sheldon and all other lathes. Thousands now in use in small and large machine shops, repair shops, railroads, schools, home work shops, etc. ORDER SIZE NEEDED TODAY!—it will quickly pay for itself.

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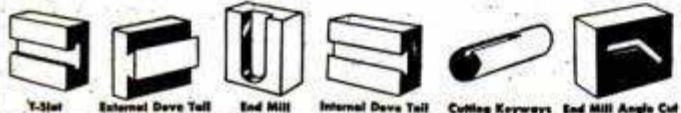
Nos.	Width Jaws	Depth Jaws	Jaws Open	Weight Pounds	Fits Tool Post	Price F.O.B. Factory
150	1 1/2"	1"	1 5/8"	6 1/2	1" Dia.	\$18.75
250	2 1/2"	1 7/16"	1 1/2"	11	1 1/4" Dia.	24.75
400	4"	1 1/2"	4"	25	2" Dia.	39.75

Order From Your Dealer or Jobber: Write for Circular No. 353
Mfrs. of PALMGREN PRODUCTS Since 1915

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JUST A FEW OPERATIONS YOU CAN DO ON YOUR LATHE!



PARTS FOR MILITARY TRUCKS

4 or 6 Wheel Drive at a SAVINGS—

1/4 ton to 20 ton.

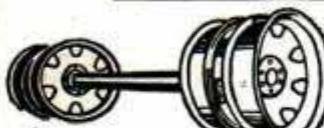
Parts List Available on Most Military Trucks and Jeep Models



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Heavy duty trailer axle suitable for many types of trailer construction. Also excellent for building of heavy farm trailers and wagons. It is a 12,000 lb. capacity square type straight

trailer axle complete with Timken roller bearings, hubs, and 6 hole 750 x 20 Budd Wheels. Without brakes. Axle is 2 inches square and 69 inches between wheel mounting flanges. Std. width. AN EXCELLENT BUY.

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Save \$30.00 On JEEP Spare Parts KIT

Originally packed for Amphibious Jeeps. Also adaptable for all military and some civilian jeeps. Contains 29 major items. Offered at our low price of... \$8.95

WINCH CABLE, 1/2", 250 ft. \$30.00

Hundreds of Other Truck & Jeep Parts and Supplies
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ENJOY SAFE — COMFORTABLE WINTER DRIVING WITH THE SIMPLEX DIRECTIONAL SWITCH

Here is a safe and comfortable way of signalling your intention to make a left or right turn. Flashes from 60 to 80 times per minute.

Kits furnished with all necessary material for perfect installation. No outside mounting of any kind. Uses your present parking and tail lights. Either of our two models fit most cars from 1942 to 1949.

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Specify year and make of car. Money back guarantee. Tested and Approved to meet SAE requirements.

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FLEXIBLE MOLDS

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Motor driven
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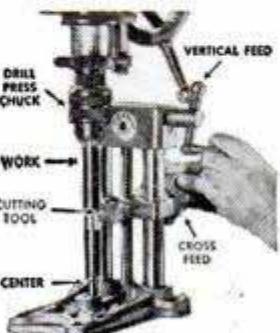
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THE AMAZING, NEW TURNBUG

Here's a precision-built attachment for any drillpress that enables you to do precision turning in metal or wood! Quickly set up and quickly taken down. Fits any drillpress table. Capacity, 4" swing. Ideal for amateur or experienced craftsman, garages or small shops. Price postpaid, only \$29.50. Satisfaction guaranteed. Order today from



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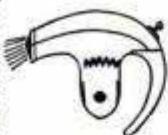
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This analyzer, featuring a sensitive repulsion type meter housed in a bakelite case, represents the culmination of 15 years achievement in the instrument field by a large company specializing in electronic test equipment.

Specifications of the AC-DC Model

Volt-Ohm-Milliammeter:	AC Volts— 0-25, 50, 125, 250 DC Volts— 0-25, 50, 125, 250 Milliamperes AC—0 to 50 DC Milliamperes— 0 to 50 Ohms Full Scale— 100,000 Ohms Center Scale— 2400 Capacity— .05 to 15 Mfd.
Total Price, prepaid anywhere in the USA— \$7.00 . Similar DC Meter, lacking the AC operated ranges of above, \$5.50 prepaid.	

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Exceptionally rugged, trouble-free design. Withstand severe overloading to many times nominal wattage rating without burning or smoking. Ideal for electroplaters, model railroaders, etc. 3 sizes available—50, 60 and 200 ohms. Regular price \$5.20. YOUR COST **\$1.00**.



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Accurate and precise 2 speed guaranteed hobby lathe, the essential machine for the home workshop. Sturdy enough for light production work or factory standby service. Supplied with 56" of belting for connecting to any available electric motor or power take-off. Also included in this unbelievable offer are such accessories as a 1½" drill chuck with specially hardened tool steel jaws, a 4" electric furnace high speed grinding wheel, a cotton buffing wheel and a large supply of buffing compound. Your cost **\$6.00**. Sole export agent. Distributor inquiries invited.

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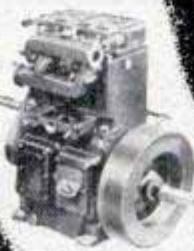
World's Only Radio with These Features

Extra high quality radio in kit form with complete instructions. Features 2 iron core LF transformers, a 2 gang condenser, and polystyrene insulated edgewise wound antenna loop. Tubes include 12AT6, 12BA6, 12BE6, 50B5 & 35W4. Receives broadcast band from 550 to 1700 KC. Kit form **\$8.75** or 2 for **\$17.00**. Assembled, wired and tested **\$12.95** or 2 for **\$25.00**.

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1 cylinder
5 horsepower
\$496.00

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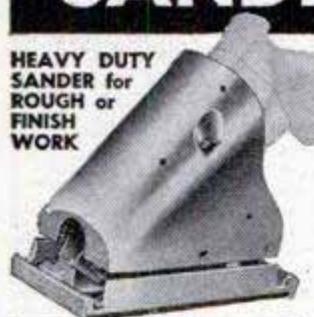
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HEAVY DUTY
SANDER for
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SANDS FLOORS OR
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IN HARD-TO-GET-AT PLACES...
'SAN-DAL' Sander Fits Any ¼" Drill

Nothing to get out of order: has only 2 moving parts, requires no oiling. For use with sandpaper (WET or DRY) or any type polishing cloth—both easily attached. Lightweight, sturdy construction—any woman can handle it. Ideal for home and shop. Sanding plate: 3½" x 7". Sander and polisher can be bought separately for \$12.95.



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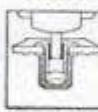
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MODEL #60—Originally designed for heavy industrial use, now priced for home workshop. Can be attached directly in chuck of your drill press. Exclusive pilot bearing (see illustration) eliminates side thrust, chatter and vibration—assures smooth cutting action. Blades can't come out—set screws hold them securely. Complete with YOUR CHOICE OF ANY 6 PAIR DOUBLE-GROUND BLADES SHOWN BELOW, only \$12.95.

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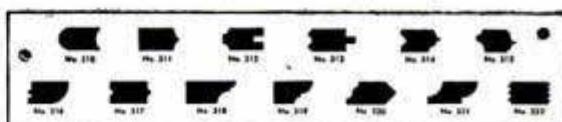


For Your Circle Saw
through. In ordering, state diameter of shaft.

Complete WITH ANY 6 PAIR OF READY-GROUND BLADES SHOWN BELOW, only \$14.95.

ALADDIN WOODSHAPING BLADES

Specify by number the blades you want. Additional blades \$1.50 each, \$3.00 per set.





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Ball bearing, low inertia reversible type. Can be used to operate small displays, models, etc. Operated from 12 volt AC with use of condenser. Normally operates 26 volt 400 cycle. Motor 588 RPM; Low speed gear 14 RPM. Extra large gear for $\frac{1}{8}$ RPM \$1.00 extra. Order #PM-4119 complete motor, gear-train, condenser, & instructions—Postpaid U.S.A....

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TRANSFORMER for above—110 volt input; output 12 volt. #PM-5119—Postpaid U.S.A.,

6 VOLT AC or DC MOTOR

Ideal for auto heaters, defrosters, fans, models, etc. Used by Gov't. in aircraft.

Shaft size: $\frac{1}{4} \times \frac{7}{8}$ "

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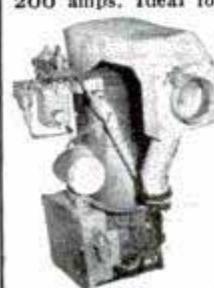
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SAVE MONEY SAVE TIME

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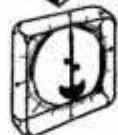
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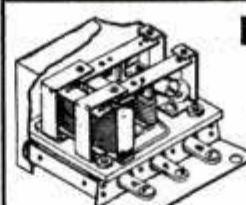
Patented lock-stitch awl, complete with 2 needles and reel of waxed thread at this special price! Satisfaction guaranteed, or money back. HUNDREDS OF USES—sewing and repairing leather goods, tents, belting, awnings, saddles, sporting goods and others. Complete instructions. Send currency, check or money order. Postpaid.

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SCIENTIFIC ELECTRIC CO., P.O. Box 2162P1, Sta. H, Cleveland 8, Ohio

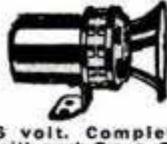
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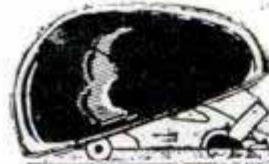
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For 1949 Chev., Ford, Pontiac
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Chrome body, transparent, unbreakable, lucite wings which illuminate. With bulb and wire. Height 8". Length 6 1/2". Choice of blue, amber and red

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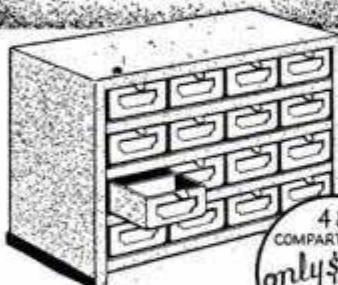
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Stamps - Pins - Buttons - Washers
Belts - Nuts - Nails - Screws

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48 COMPARTMENTS
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6-8 1/2" x 12 1/2"

SIZES**DESCRIPTION**

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6"-12 1/4"-15 1/4"

★ Baked enamel cabinet

64 Drawer

6"-24 1/2"-15 1/4"

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13 1/4"-23 1/4"-5 1/4"

★ Spot welded steel cabinet

★ Removable dividers, index cards in aluminum drawers

PRICES

16 Drawers - Aluminum	\$4.80
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Satisfaction Guaranteed

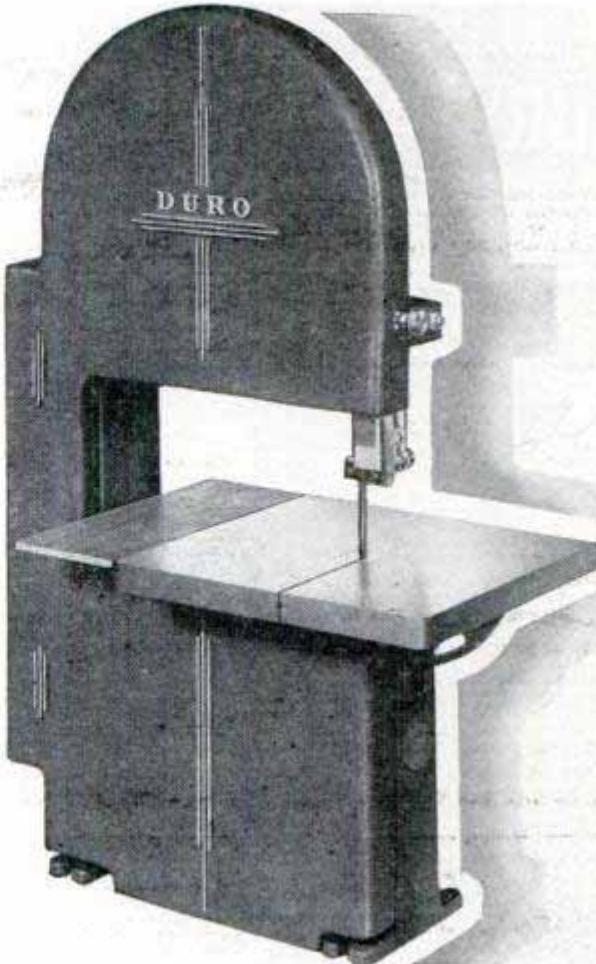
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High-priced features at lowest cost!

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BALL BEARING BLADE GUIDES—Patented, exclusive with Duro, these ball bearing blade guides above and below the table reduce friction heat and wear, keep the blade running truer, smoother.

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OTHER ADVANTAGES include rubber-tired disc wheels on needle type bearings, double trunnion table supports, separate tension knobs for blade adjustment, heavy cast iron table with extension tilts to 45°—and many others.

DURO 10" BAND SAW only \$49.95 less motor

See this new saw and others in the complete 1950 DURO Power Tool line at your dealers. Or, write for full details and specifications today.

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Gentlemen:

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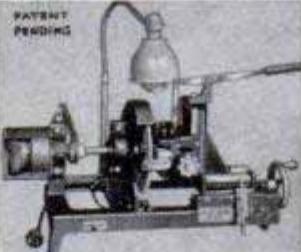
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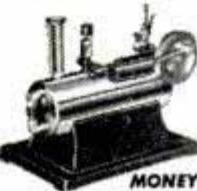
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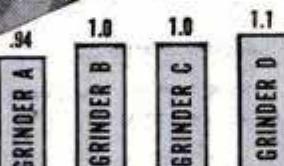
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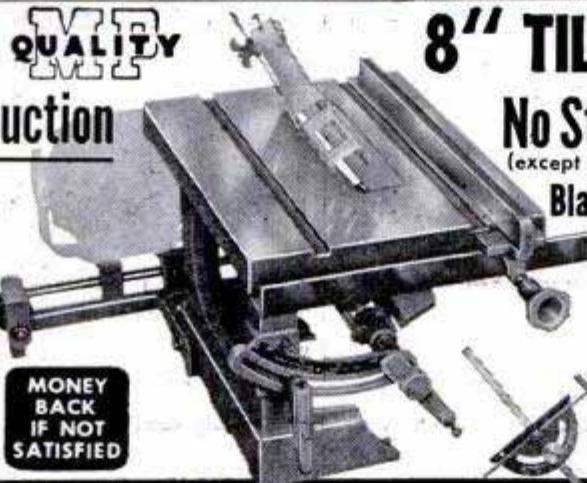
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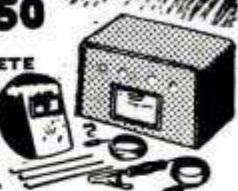
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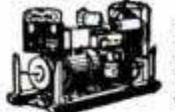
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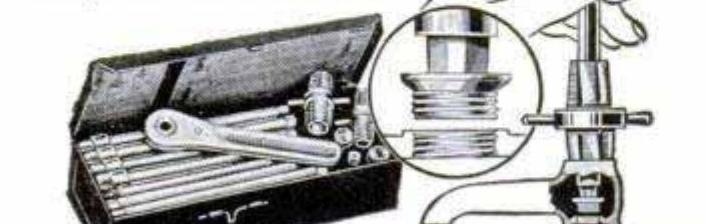
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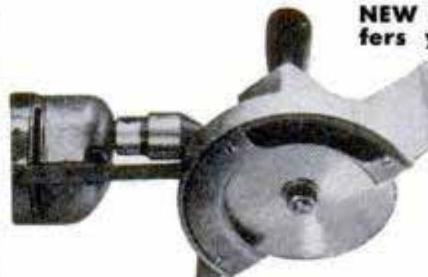
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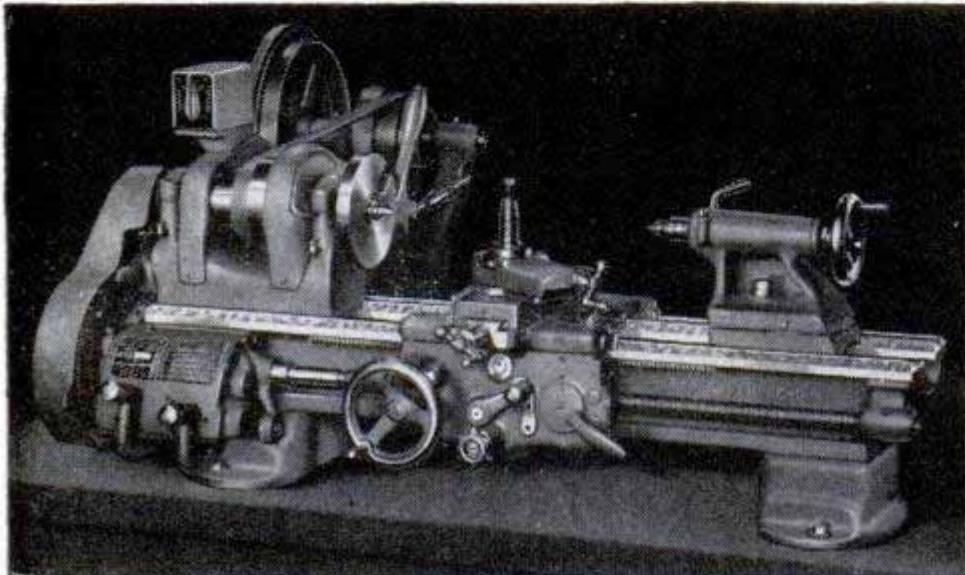
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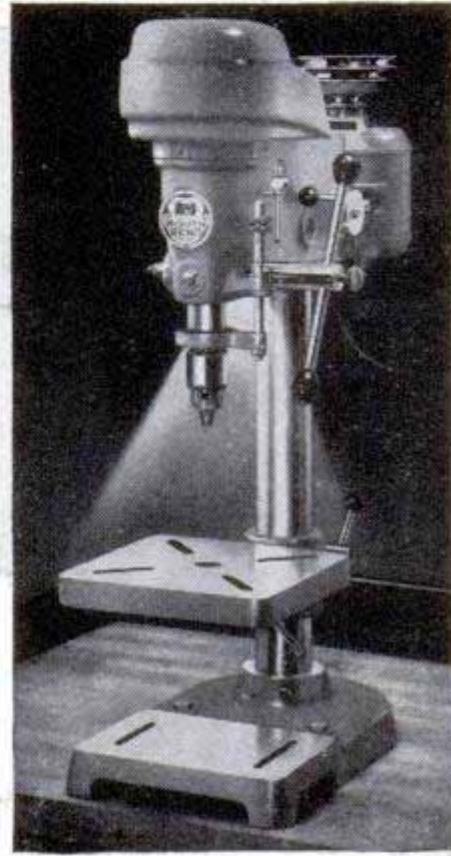
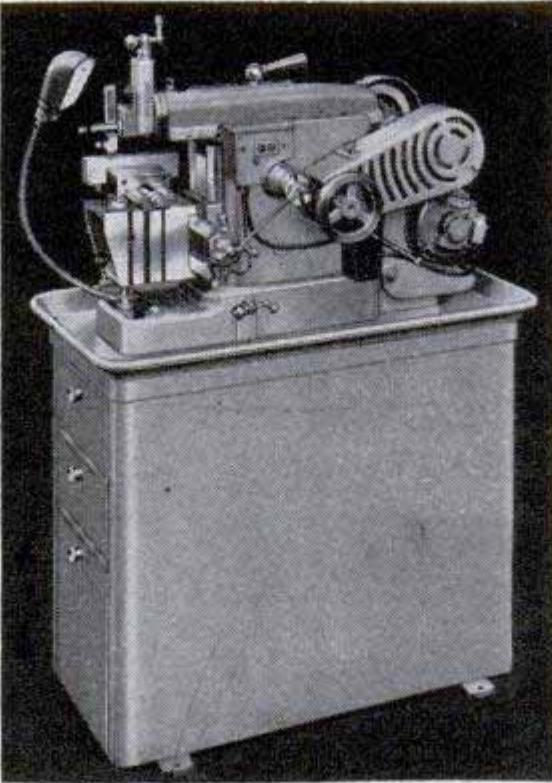
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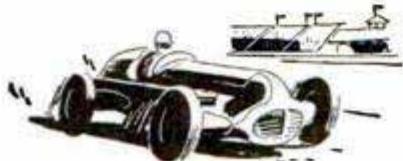
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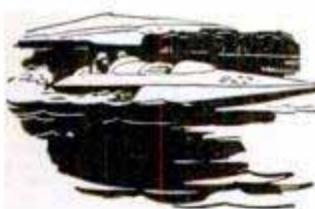
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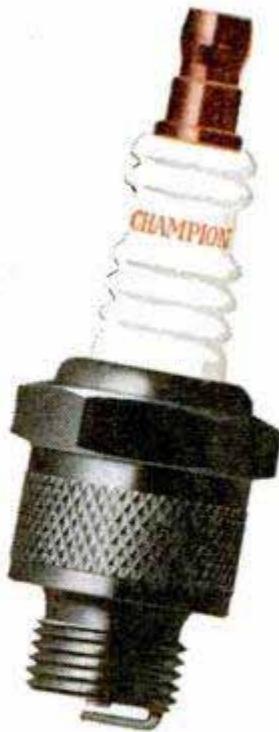


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UNEQUALLED BY ANY OTHER SPARK PLUG!

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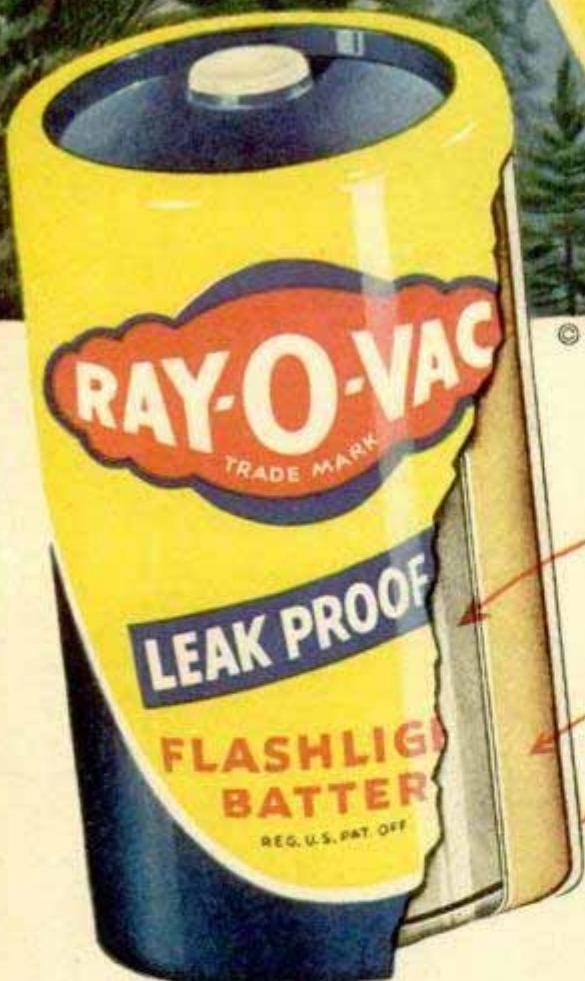
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